NOAA Technical Report NMFS 118

May 1994

Pictorial Guide to the Groupers (Teleostei: Serranidae) of the Western North Atlantic

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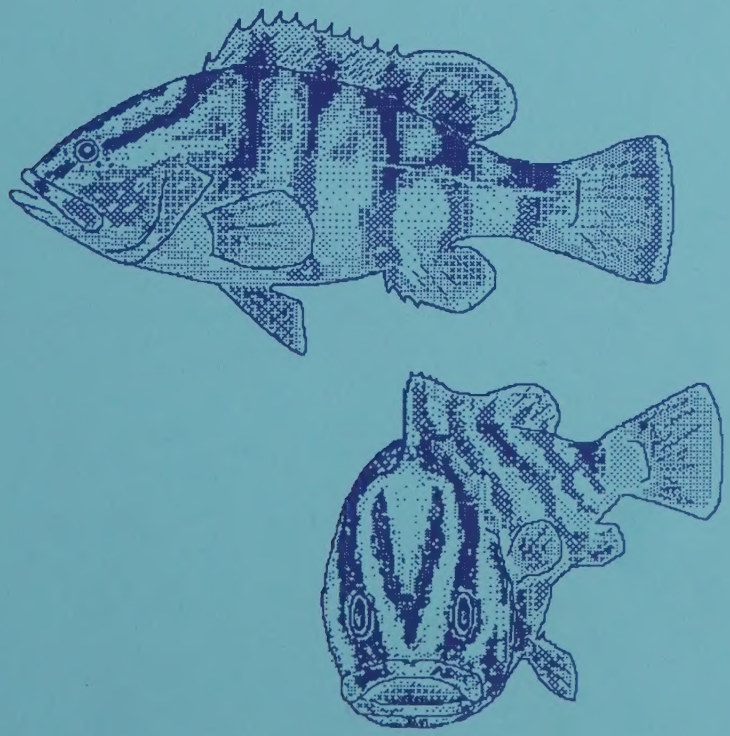

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NOAA Technical Report NMFS 118
A Technical Report of the *Fishery Bulletin*

Pictorial Guide to the Groupers (Teleostei: Serranidae) of the Western North Atlantic

Mark Grace
Kevin R. Rademacher
Mike Russell

Illustrations by Mark Grace

May 1994

U.S. Department of Commerce
Seattle, Washington

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Pictorial Guide to the Groupers (Teleostei: Serranidae) of the Western North Atlantic[1]

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ABSTRACT

This guide was developed to assist with the identification of western North Atlantic grouper species of the genera *Alphestes, Cephalopholis, Dermatolepis, Epinephelus, Gonioplectrus, Mycteroperca,* and *Paranthias.* The primary purpose for assembling the guide is for use with projects that deploy underwater video camera systems. The most vital source of information used to develop the guide was an archive of underwater video footage recorded during fishery projects. These video tapes contain 348 hours of survey activity and are maintained at the National Marine Fisheries Service (NMFS), Pascagoula, Mississippi. This footage spans several years (1980–92) and was recorded under a wide variety of conditions depicting diverse habitats from areas of the western North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Published references were used as sources of information for those species not recorded on video footage during NMFS projects. These references were also used to augment information collected from video footage to provide broader and more complete descriptions. The pictorial guide presents information for all 25 grouper species reported to occur in the western North Atlantic. Species accounts provide descriptive text and illustrations depicting documented phases for the various groupers. In addition, species separation sheets based on important identification features were constructed to further assist with species identification. A meristic table provides information for specimens captured in conjunction with video-assisted fishery surveys. A computerized version enables guide users to amend, revise, update, or customize the guide as new observations and information become available.

Introduction

An important survey technique uses underwater video camera systems to assess populations, species complexes, and behavior. During these underwater surveys of fishes in their natural habitat, groupers frequently exhibit behavior and body pattern phases that are not normally observed. In addition, because specimens cannot be physically handled (except when captured), standard identification methods that rely on physical examination are generally not feasible.

Groupers may be difficult to identify from live and videotaped underwater footage because several morphological features (Fig. 1) and body pattern phases vary because of ontogeny, behavior, or habitat. Documenting these features and phases is essential to accurately and consistently identify species from video footage.

Important identification features (Table 1) were used to develop species separation sheets (Figs. 2–11) to help users identify specimens. Species accounts composed of descriptions and illustrations of important distinguishing features (including variations in morphology and body pattern phases) and distributional information are provided for each species. The guide's illustrations are computer graphic and provide

[1] Scientific Editor's Note: The following pictorial guide represents a new approach to identifying fishes under difficult underwater conditions. The authors' objectives were to provide a computerized guide in an accessible format to allow ready updating and, secondarily, to publish the guide in a traditional paperbound format. We are publishing the figures as they will appear on the computer screen, understanding that semidiagrammatic graphics are less desirable for publication than morphologically detailed illustrations. As noted, the authors will provide the guide on disk and will distribute periodic updates to all requestors.

interpretations of gross external features that are the basis for identifying species from underwater footage.

A meristic table (Table 2) was compiled from values presented in published taxonomic references. The table may be referred to in identifying captured specimens; however, traditional taxonomic keys should be consulted to positively identify specimens based on meristic values.

Several critical factors for identifying groupers were determined during extensive reviews of archived video footage. Most significant was discerning important distinguishing features, which were at times obscured by distortions created by the camera's depth of field and loss of light because of water depth and clarity. Other factors included the orientation and number of specimens within the camera's field and the electronic quality of video recordings.

The development of this pictorial guide resulted from attempts to use traditional taxonomic references and field guides during video-assisted fishery surveys. In addition, as the archive of video footage was examined it became apparent that many of the phases exhibited by groupers were undocumented. This pictorial guide presents information that will help users identify groupers for projects that deploy underwater cameras. As other programs are initiated and additional information is collected, the guide can be revised to include new observations.

Methods

Information presented in this pictorial guide resulted from observations of underwater video footage, physical examination of specimens, and compilation of literature. Survey footage was reviewed, and segments with groupers were cataloged. Often it was necessary to replay particular video segments to properly identify specimens. Identifications were frequently confirmed by consensus of the authors. Following the identification of a specimen, pencil sketches and notations pertaining to important identification features were made. Taxonomic keys and field guides were used when physical examination of specimens was possible.

A general body shape for each species was drawn by hand, then digitized to enable further detailed illustration of body pattern phases and morphological characteristics. Illustrations were incorporated into document form with appropriate text. The computerized document is DOS compatible and operates within Microsoft Windows (version 3.0 or higher).

Distinguishing features that were found to be most useful for identifying species were used as the basis for separation sheets. The usefulness of distinguishing features was assessed by grouping species that shared these features. The distinguishing features chosen for the separation sheets were least difficult to discern from footage and were effective for grouping similar species. Broadly interspecific distinguishing features proved to be of limited value because the separation sheets that resulted were cumbersome and did not effectively group species. Other distinguishing features were excluded because they were difficult to discern from footage (e.g. the serrated angle of the preopercle).

The species accounts are arranged in alphabetical order according to scientific names. Descriptive text of each body pattern phase is presented parallel to the order of figures illustrating each phase and is followed by descriptions of morphological features and their variations, size range, distribution, or other particular attributes (e.g. similarities with other species). Of the 25 grouper species presented, the jewfish, dusky, misty, and white groupers were not encountered during the video-assisted surveys. Information for these four species was compiled from published references.

The term "elongate rays" is used in place of "exserted rays." Maximum size is the total length in centimeters (cm). General body shade or color is referred to as "background" on the separation sheets. "Drawn in part" or "redrawn in part" indicate a figure was drawn or redrawn primarily from the cited reference, but features as described or illustrated in other references, or discerned from video footage, were included to complete the illustration. Other definitions for terms used to describe species are taken from Heemstra and Randall (1993) as follows:

BARS are elongate, vertical or subvertical color marks.

BANDS are oblique or horizontal ribbon-like markings, approximately one or two eye diameters in width.

STRIPES are narrow, oblique, or horizontal markings, less than an eye diameter in width.

BLOTCHES are areas larger than the eye that usually have an irregular or indistinct border.

DOTS are nostril-sized or smaller.

SPOTS are larger than dots and smaller than blotches, usually with a regular or distinct border.

A SADDLE-BLOTCH is a dark, saddle-shaped blotch on the dorsal part of the body or caudal peduncle.

The MAXILLARY STREAK (or "moustache streak") is a dark streak along the edge of the maxillary groove, which is below the eye and hidden by the maxilla when the mouth is closed.

Recent changes in nomenclature have been included: *Cephalopholis*, *Dermatolepis*, and *Alphestes* are considered valid genera, and *Mycteroperca acutirostris*

is the valid name for the comb grouper (Randall and Heemstra, 1991; Heemstra, 1991; Heemstra and Randall, 1993). Nomenclature of the white grouper, *Mycteroperca cidi*, is taken from Cervigon (1966). Nomenclature of all other species follows Robins et al. (1991).

General Description of Groupers

Groupers are bottom dwellers and generally prefer areas that offer cover (Smith, 1971). Some species inhabit crevices, ledges, reefs (both natural and artificial), or other underwater structures. Yellowedge groupers, *Epinephelus flavolimbatus*, have been observed inhabiting, and are believed to construct, burrow-like trenches (Jones et al., 1989). Juvenile red groupers, *Epinephelus morio*, burrow in the laboratory and probably in the wild as well; juvenile gag, *Mycteroperca microlepis*, and red groupers have been reported from inshore grass beds; juvenile jewfish, *Mycteroperca itajara*, from mangrove areas.[2] Although groupers tend to be solitary, small single-species groups were observed in survey footage and some locations hosted several species. Nassau groupers, *Epinephelus striatus*, are known to form very large spawning aggregations.[3] Creole-fish, *Paranthias furcifer*, form aggregations as well.

A striking feature of many groupers is their ability to quickly change color or body patterns. This behavior has been widely documented and has been attributed to a number of factors, including changes in habitat, light, and water depth, and behavior related to feeding, spawning, and defense, such as camouflaging or warding off other fish (Smith, 1971). Groupers have well-developed air bladders that enable them to slowly roam, hover, or remain almost motionless.

Groupers are characterized by a variety of morphological features (Fig. 1). In general, they have large mouths and thick bodies, which range in shape from elongate to robust or compressed. The dorsal fin is composed of spines (spinous dorsal) and soft rays (soft dorsal). Caudal-fin shapes may vary from rounded to forked. Pectoral and pelvic fins are beneath the spinous dorsal fin; the anal fin is beneath the soft dorsal fin. The single lateral line terminates at the caudal peduncle. Adults range in maximum length from 31 cm for the graysby, *Cephalopholis cruentata*, mutton hamlet, *Alphestes afer*, and Spanish flag, *Gonioplectrus hispanus*, to 213 cm for the jewfish, *Epinephelus itajara*.

[2] Koenig, C., Florida State University, Tallahassee, FL. Personal commun., February 1993.

[3] Sadovy, Y., Caribbean Fishery Management Council, Hato Rey, Puerto Rico. Personal commun., November 1992.

Using the guide

Once it is determined that the specimen is a grouper, refer to Table 1 and select one or more of the ten identification features that apply to the specimen. These important identification features correspond to separation sheets that group specimens exhibiting similar features. If none of the identification features presented in Table 1 are discernible, the identification process should not proceed.

All species are included on as many of the separation sheets as are applicable. Each separation sheet has been designed as a flow chart. A bold "feature box" in the upper left-hand corner contains one of the ten important identification features. Branching from this feature box are secondary features that ultimately lead to a species determination. Use the process of elimination to work through the separation sheets. Species that exhibit more than one important identification feature appear on more than one separation sheet.

Several conditions contribute to why a specimen may not fit within any of the separation sheets. The user may be observing a morphological feature or body pattern phase that was found not to be useful for species identifications or was not accounted for in the guide. Another condition may be that the user does not have a clear or accurate view of the specimen or its important identification features. Under these conditions, identify specimens only to the lowest reliable taxon.

After the specimen has been identified to species, refer to the species accounts for further clarification. Species accounts include specific information pertaining to distinguishing features, ontogenetic factors, size range, and distribution. Illustrations depict documented phases; the labels identify key features. Even though some features described in species accounts and depicted in illustrations will be difficult or impossible to discern from footage (i.e. number of dorsal-fin spines, gill raker counts, coloration, serrated angle of preopercle), they have been included for captured specimens.

Descriptions such as "small eyes"or "large blotches" are not quantitative terms. The use of proportionalities are unreliable because of distortions that are likely to occur when using underwater camera or video systems. Species illustrations may be referred to for a general sense of scale.

Discussion

Assembling information from video footage into document form required many hours of effort, particularly in developing skills for interpreting footage. As

a result, the guide provides a wide range of information describing grouper phases and variations, many of which were previously undocumented. Development of this guide is of particular significance because prior to publication, no previous references specifically addressed identification of groupers from underwater footage. Additional information from underwater surveys can be easily assimilated into the computerized version, which removes the inflexible barrier of bound references to accommodate new information. The guide will hopefully provide a useful format for future video-assisted marine fishery studies.

Users with DOS compatible systems can amend, revise, update, or customize (e.g. translate into another computer language) this pictorial guide by working within Microsoft Windows (version 3.0 or higher). This program provides options for reconfiguring illustrations (Paintbrush) and changing text (Write) as needed. To request a copy of the computerized version, users are asked to mail a high density diskette with a diskette mailing envelope to one of the authors at Mississippi Laboratories.[4] Fonts and page layouts differ between the printed and computerized versions.

[4] The U.S. Department of Commerce, NOAA, does not guarantee the file integrity or accuracy of the distributed computer files because of the possibility of infection by computer virus or alterations to files, either while under its control or under the control of subsequent users.

Guide to the Groupers

Table 1

Identification features for western Atlantic groupers (Serranidae). Select features that apply to the specimen then refer to the feature box of the appropriate separation sheet (Figs. 2–11).

Feature	Separation sheet figure
1. Elongate rays extend past the margin of the soft dorsal, caudal, or anal fins.	2
2. Caudal fin forked, rounded, emarginate, or concave.	3
3. Saddle-blotch, bar, or two dark spots on the caudal peduncle.	4
4. One or several stripes or bands radiate from or continue through eye.	5
5. Spinous dorsal, soft dorsal, caudal, anal, or pectoral fins with white or pale margins.	6
6. Spinous dorsal, soft dorsal, caudal, anal, or pectoral fins with dark submarginal bands or dark margins.	7
7. Spots on head or body lighter than background.	8
8. Spots on head or body darker than background.	9
9. Body with horizontal, vertical, or oblique stripes, bars, or bands.	10
10. Body with regular or irregular shaped blotches.	11

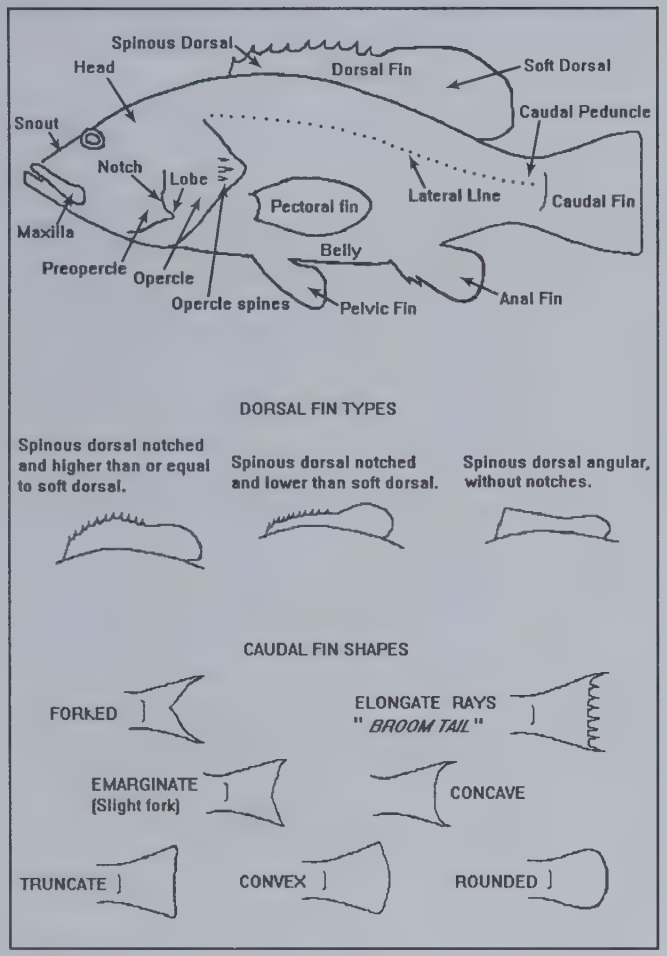

Figure 1
Selected morphological features of groupers (Serranidae).

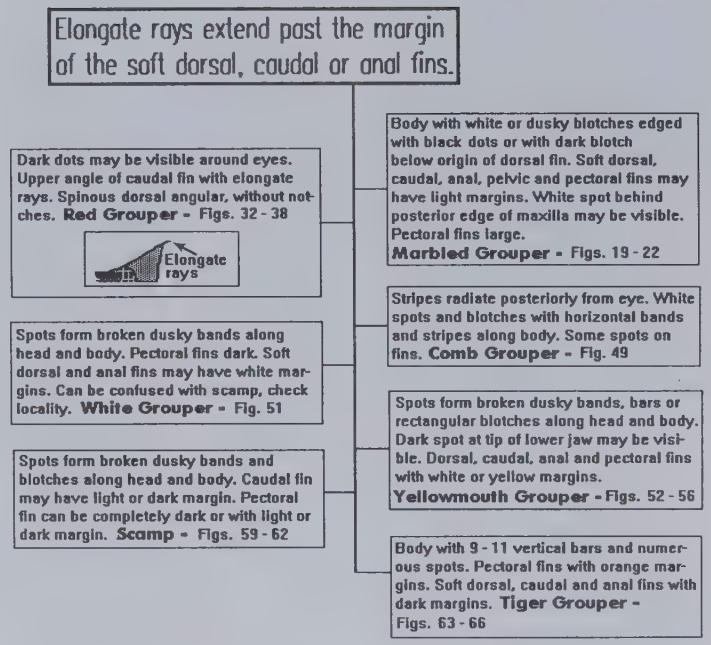
Elongate rays extend past the margin of the soft dorsal, caudal or anal fins.
Dark dots may be visible around eyes. Upper angle of caudal fin with elongate rays. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Elongate rays
Spots form broken dusky bands along head and body. Pectoral fins dark. Soft dorsal and anal fins may have white margins. Can be confused with scamp, check locality. White Grouper - Fig. 51
Spots form broken dusky bands and blotches along head and body. Caudal fin may have light or dark margin. Pectoral fin can be completely dark or with light or dark margin. Scamp - Figs. 59 - 62
Body with white or dusky blotches edged with black dots or with dark blotch below origin of dorsal fin. Soft dorsal, caudal, anal, pelvic and pectoral fins may have light margins. White spot behind posterior edge of maxilla may be visible. Pectoral fins large. Marbled Grouper - Figs. 19 - 22
Stripes radiate posteriorly from eye. White spots and blotches with horizontal bands and stripes along body. Some spots on fins. Comb Grouper - Fig. 49
Spots form broken dusky bands, bars or rectangular blotches along head and body. Dark spot at tip of lower jaw may be visible. Dorsal, caudal, anal and pectoral fins with white or yellow margins. Yellowmouth Grouper - Figs. 52 - 56
Body with 9 - 11 vertical bars and numerous spots. Pectoral fins with orange margins. Soft dorsal, caudal and anal fins with dark margins. Tiger Grouper - Figs. 63 - 66

Figure 2
Separation sheet for western Atlantic groupers (Serranidae) with elongate rays extending past the margin of the soft dorsal, caudal, or anal fins. See Contents or species accounts for scientific names.

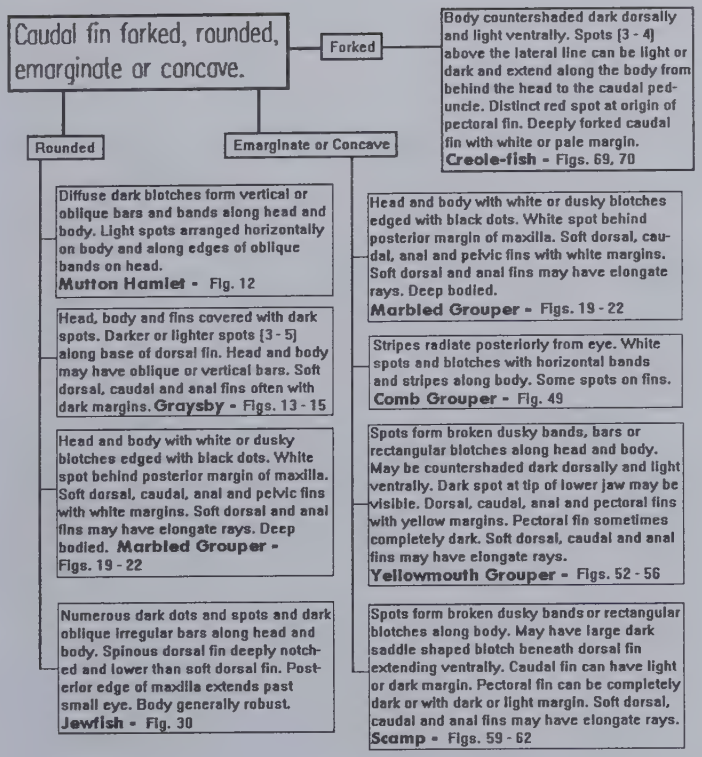
Caudal fin forked, rounded, emarginate or concave.
Forked
Body countershaded dark dorsally and light ventrally. Spots (3 - 4) above the lateral line can be light or dark and extend along the body from behind the head to the caudal peduncle. Distinct red spot at origin of pectoral fin. Deeply forked caudal fin with white or pale margin. Creole-fish - Figs. 69, 70
Rounded
Emarginate or Concave
Diffuse dark blotches form vertical or oblique bars and bands along head and body. Light spots arranged horizontally on body and along edges of oblique bands on head. Mutton Hamlet - Fig. 12
Head, body and fins covered with dark spots. Darker or lighter spots (3 - 5) along base of dorsal fin. Head and body may have oblique or vertical bars. Soft dorsal, caudal and anal fins often with dark margins. Graysby - Figs. 13 - 15
Head and body with white or dusky blotches edged with black dots. White spot behind posterior margin of maxilla. Soft dorsal, caudal, anal and pelvic fins with white margins. Soft dorsal and anal fins may have elongate rays. Deep bodied. Marbled Grouper - Figs. 19 - 22
Numerous dark dots and spots and dark oblique irregular bars along head and body. Spinous dorsal fin deeply notched and lower than soft dorsal fin. Posterior edge of maxilla extends past small eye. Body generally robust. Jewfish - Fig. 30
Head and body with white or dusky blotches edged with black dots. White spot behind posterior margin of maxilla. Soft dorsal, caudal, anal and pelvic fins with white margins. Soft dorsal and anal fins may have elongate rays. Deep bodied. Marbled Grouper - Figs. 19 - 22
Stripes radiate posteriorly from eye. White spots and blotches with horizontal bands and stripes along body. Some spots on fins. Comb Grouper - Fig. 49
Spots form broken dusky bands, bars or rectangular blotches along head and body. May be countershaded dark dorsally and light ventrally. Dark spot at tip of lower jaw may be visible. Dorsal, caudal, anal and pectoral fins with yellow margins. Pectoral fin sometimes completely dark. Soft dorsal, caudal and anal fins may have elongate rays. Yellowmouth Grouper - Figs. 52 - 56
Spots form broken dusky bands or rectangular blotches along body. May have large dark saddle shaped blotch beneath dorsal fin extending ventrally. Caudal fin can have light or dark margin. Pectoral fin can be completely dark or with dark or light margin. Soft dorsal, caudal and anal fins may have elongate rays. Scamp - Figs. 59 - 62

Figure 3

Separation sheet for western Atlantic groupers (Serranidae) with caudal fin forked, rounded, emarginate, or concave. See Contents or species accounts for scientific names.

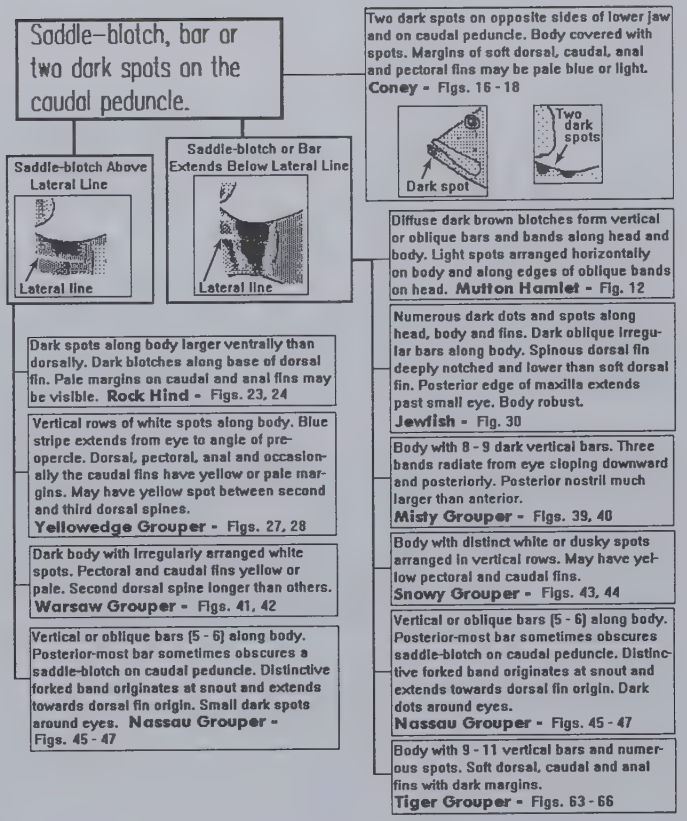
Saddle–blotch, bar or two dark spots on the caudal peduncle.
Two dark spots on opposite sides of lower jaw and on caudal peduncle. Body covered with spots. Margins of soft dorsal, caudal, anal and pectoral fins may be pale blue or light. Coney - Figs. 16 - 18
Dark spot
Two dark spots
Saddle-blotch Above Lateral Line
Lateral line
Saddle-blotch or Bar Extends Below Lateral Line
Lateral line
Diffuse dark brown blotches form vertical or oblique bars and bands along head and body. Light spots arranged horizontally on body and along edges of oblique bands on head. Mutton Hamlet - Fig. 12
Numerous dark dots and spots along head, body and fins. Dark oblique irregular bars along body. Spinous dorsal fin deeply notched and lower than soft dorsal fin. Posterior edge of maxilla extends past small eye. Body robust. Jewfish - Fig. 30
Dark spots along body larger ventrally than dorsally. Dark blotches along base of dorsal fin. Pale margins on caudal and anal fins may be visible. Rock Hind - Figs. 23, 24
Body with 8 - 9 dark vertical bars. Three bands radiate from eye sloping downward and posteriorly. Posterior nostril much larger than anterior. Misty Grouper - Figs. 39, 40
Vertical rows of white spots along body. Blue stripe extends from eye to angle of preopercle. Dorsal, pectoral, anal and occasionally the caudal fins have yellow or pale margins. May have yellow spot between second and third dorsal spines. Yellowedge Grouper - Figs. 27, 28
Body with distinct white or dusky spots arranged in vertical rows. May have yellow pectoral and caudal fins. Snowy Grouper - Figs. 43, 44
Dark body with irregularly arranged white spots. Pectoral and caudal fins yellow or pale. Second dorsal spine longer than others. Warsaw Grouper - Figs. 41, 42
Vertical or oblique bars (5 - 6) along body. Posterior-most bar sometimes obscures a saddle-blotch on caudal peduncle. Distinctive forked band originates at snout and extends towards dorsal fin origin. Small dark spots around eyes. Nassau Grouper - Figs. 45 - 47
Vertical or oblique bars (5 - 6) along body. Posterior-most bar sometimes obscures saddle-blotch on caudal peduncle. Distinctive forked band originates at snout and extends towards dorsal fin origin. Dark dots around eyes. Nassau Grouper - Figs. 45 - 47
Body with 9 - 11 vertical bars and numerous spots. Soft dorsal, caudal and anal fins with dark margins. Tiger Grouper - Figs. 63 - 66

Figure 4

Separation sheet for western Atlantic groupers (Serranidae) with saddle-blotch, bar, or two dark spots on the caudal peduncle. See Contents or species accounts for scientific names.

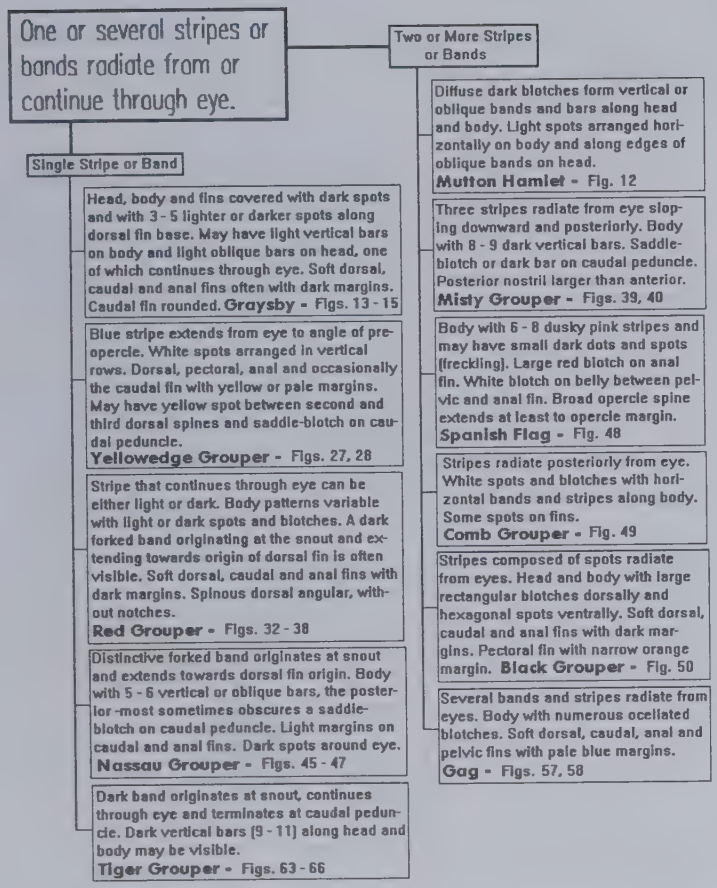
One or several stripes or bands radiate from or continue through eye.
Single Stripe or Band
Head, body and fins covered with dark spots and with 3 - 5 lighter or darker spots along dorsal fin base. May have light vertical bars on body and light oblique bars on head, one of which continues through eye. Soft dorsal, caudal and anal fins often with dark margins. Caudal fin rounded. Graysby - Figs. 13 - 15
Blue stripe extends from eye to angle of preopercle. White spots arranged in vertical rows. Dorsal, pectoral, anal and occasionally the caudal fin with yellow or pale margins. May have yellow spot between second and third dorsal spines and saddle-blotch on caudal peduncle. Yellowedge Grouper - Figs. 27, 28
Stripe that continues through eye can be either light or dark. Body patterns variable with light or dark spots and blotches. A dark forked band originating at the snout and extending towards origin of dorsal fin is often visible. Soft dorsal, caudal and anal fins with dark margins. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Distinctive forked band originates at snout and extends towards dorsal fin origin. Body with 5 - 6 vertical or oblique bars, the posterior-most sometimes obscures a saddle-blotch on caudal peduncle. Light margins on caudal and anal fins. Dark spots around eye. Nassau Grouper - Figs. 45 - 47
Dark band originates at snout, continues through eye and terminates at caudal peduncle. Dark vertical bars (9 - 11) along head and body may be visible. Tiger Grouper - Figs. 63 - 66
Two or More Stripes or Bands
Diffuse dark blotches form vertical or oblique bands and bars along head and body. Light spots arranged horizontally on body and along edges of oblique bands on head. Mutton Hamlet - Fig. 12
Three stripes radiate from eye sloping downward and posteriorly. Body with 8 - 9 dark vertical bars. Saddle-blotch or dark bar on caudal peduncle. Posterior nostril larger than anterior. Misty Grouper - Figs. 39, 40
Body with 6 - 8 dusky pink stripes and may have small dark dots and spots (freckling). Large red blotch on anal fin. White blotch on belly between pelvic and anal fin. Broad opercle spine extends at least to opercle margin. Spanish Flag - Fig. 48
Stripes radiate posteriorly from eye. White spots and blotches with horizontal bands and stripes along body. Some spots on fins. Comb Grouper - Fig. 49
Stripes composed of spots radiate from eyes. Head and body with large rectangular blotches dorsally and hexagonal spots ventrally. Soft dorsal, caudal and anal fins with dark margins. Pectoral fin with narrow orange margin. Black Grouper - Fig. 50
Several bands and stripes radiate from eyes. Body with numerous ocellated blotches. Soft dorsal, caudal, anal and pelvic fins with pale blue margins. Gag - Figs. 57, 58

Figure 5

Separation sheet for western Atlantic groupers (Serranidae) with one or several stripes or bands radiating from or continuing through eye. See Contents or species accounts for scientific names.

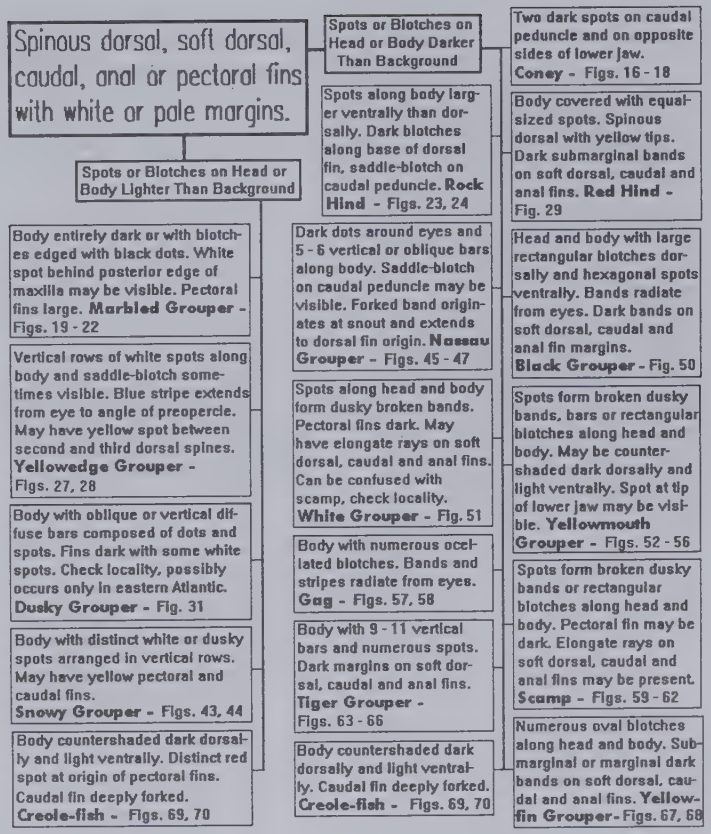
Spinous dorsal, soft dorsal, caudal, anal or pectoral fins with white or pale margins.
Spots or Blotches on Head or Body Lighter Than Background
Body entirely dark or with blotches edged with black dots. White spot behind posterior edge of maxilla may be visible. Pectoral fins large. Marbled Grouper - Figs. 19 - 22
Vertical rows of white spots along body and saddle-blotch sometimes visible. Blue stripe extends from eye to angle of preopercle. May have yellow spot between second and third dorsal spines. Yellowedge Grouper - Figs. 27, 28
Body with oblique or vertical diffuse bars composed of dots and spots. Fins dark with some white spots. Check locality, possibly occurs only in eastern Atlantic. Dusky Grouper - Fig. 31
Body with distinct white or dusky spots arranged in vertical rows. May have yellow pectoral and caudal fins. Snowy Grouper - Figs. 43, 44
Body countershaded dark dorsally and light ventrally. Distinct red spot at origin of pectoral fins. Caudal fin deeply forked. Creole-fish - Figs. 69, 70
Spots or Blotches on Head or Body Darker Than Background
Spots along body larger ventrally than dorsally. Dark blotches along base of dorsal fin, saddle-blotch on caudal peduncle. Rock Hind - Figs. 23, 24
Dark dots around eyes and 5 - 6 vertical or oblique bars along body. Saddle-blotch on caudal peduncle may be visible. Forked band originates at snout and extends to dorsal fin origin. Nassau Grouper - Figs. 45 - 47
Spots along head and body form dusky broken bands. Pectoral fins dark. May have elongate rays on soft dorsal, caudal and anal fins. Can be confused with scamp, check locality. White Grouper - Fig. 51
Body with numerous ocellated blotches. Bands and stripes radiate from eyes. Gag - Figs. 57, 58
Body with 9 - 11 vertical bars and numerous spots. Dark margins on soft dorsal, caudal and anal fins. Tiger Grouper - Figs. 63 - 66
Body countershaded dark dorsally and light ventrally. Caudal fin deeply forked. Creole-fish - Figs. 69, 70
Two dark spots on caudal peduncle and on opposite sides of lower jaw. Coney - Figs. 16 - 18
Body covered with equal-sized spots. Spinous dorsal with yellow tips. Dark submarginal bands on soft dorsal, caudal and anal fins. Red Hind - Fig. 29
Head and body with large rectangular blotches dorsally and hexagonal spots ventrally. Bands radiate from eyes. Dark bands on soft dorsal, caudal and anal fin margins. Black Grouper - Fig. 50
Spots form broken dusky bands, bars or rectangular blotches along head and body. May be countershaded dark dorsally and light ventrally. Spot at tip of lower jaw may be visible. Yellowmouth Grouper - Figs. 52 - 56
Spots form broken dusky bands or rectangular blotches along head and body. Pectoral fin may be dark. Elongate rays on soft dorsal, caudal and anal fins may be present. Scamp - Figs. 59 - 62
Numerous oval blotches along head and body. Submarginal or marginal dark bands on soft dorsal, caudal and anal fins. Yellowfin Grouper - Figs. 67, 68

Figure 6

Separation sheet for western Atlantic groupers (Serranidae) with spinous dorsal, soft dorsal, caudal, anal, or pectoral fins with white or pale margins. See Contents or species accounts for scientific names.

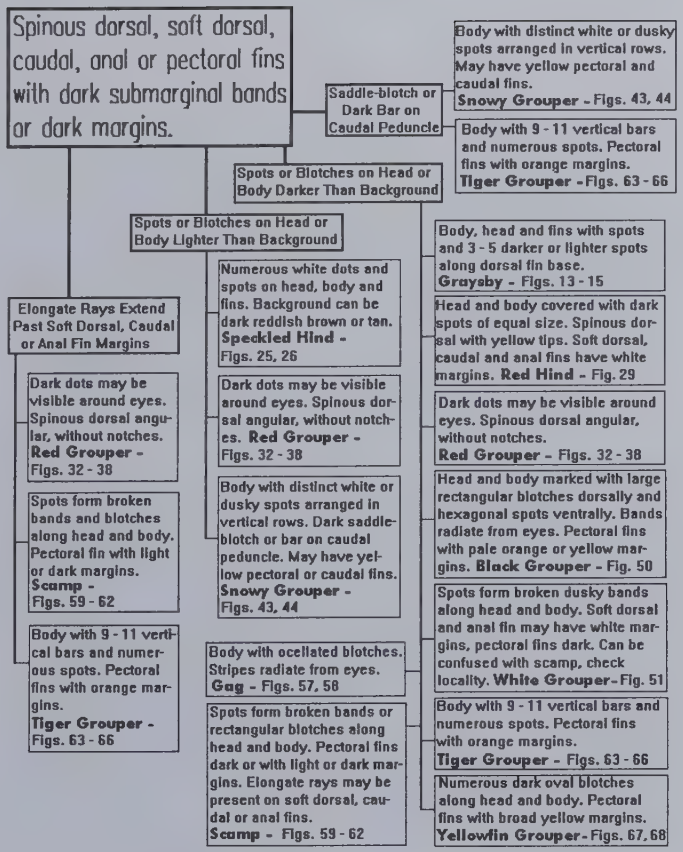
Spinous dorsal, soft dorsal, caudal, anal or pectoral fins with dark submarginal bands or dark margins.
Saddle-blotch or Dark Bar on Caudal Peduncle
Body with distinct white or dusky spots arranged in vertical rows. May have yellow pectoral and caudal fins. Snowy Grouper - Figs. 43, 44
Body with 9 - 11 vertical bars and numerous spots. Pectoral fins with orange margins. Tiger Grouper - Figs. 63 - 66
Spots or Blotches on Head or Body Darker Than Background
Spots or Blotches on Head or Body Lighter Than Background
Elongate Rays Extend Past Soft Dorsal, Caudal or Anal Fin Margins
Dark dots may be visible around eyes. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Spots form broken bands and blotches along head and body. Pectoral fin with light or dark margins. Scamp - Figs. 59 - 62
Body with 9 - 11 vertical bars and numerous spots. Pectoral fins with orange margins. Tiger Grouper - Figs. 63 - 66
Numerous white dots and spots on head, body and fins. Background can be dark reddish brown or tan. Speckled Hind - Figs. 25, 26
Dark dots may be visible around eyes. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Body with distinct white or dusky spots arranged in vertical rows. Dark saddle-blotch or bar on caudal peduncle. May have yellow pectoral or caudal fins. Snowy Grouper - Figs. 43, 44
Body with ocellated blotches. Stripes radiate from eyes. Gag - Figs. 57, 58
Spots form broken bands or rectangular blotches along head and body. Pectoral fins dark or with light or dark margins. Elongate rays may be present on soft dorsal, caudal or anal fins. Scamp - Figs. 59 - 62
Body, head and fins with spots and 3 - 5 darker or lighter spots along dorsal fin base. Graysby - Figs. 13 - 15
Head and body covered with dark spots of equal size. Spinous dorsal with yellow tips. Soft dorsal, caudal and anal fins have white margins. Red Hind - Fig. 29
Dark dots may be visible around eyes. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Head and body marked with large rectangular blotches dorsally and hexagonal spots ventrally. Bands radiate from eyes. Pectoral fins with pale orange or yellow margins. Black Grouper - Fig. 50
Spots form broken dusky bands along head and body. Soft dorsal and anal fin may have white margins, pectoral fins dark. Can be confused with scamp, check locality. White Grouper - Fig. 51
Body with 9 - 11 vertical bars and numerous spots. Pectoral fins with orange margins. Tiger Grouper - Figs. 63 - 66
Numerous dark oval blotches along head and body. Pectoral fins with broad yellow margins. Yellowfin Grouper - Figs. 67, 68

Figure 7

Separation sheet for western Atlantic groupers (Serranidae) with spinous dorsal, soft dorsal, caudal, anal, or pectoral fins with dark submarginal bands or dark margins. See Contents or species accounts for scientific names.

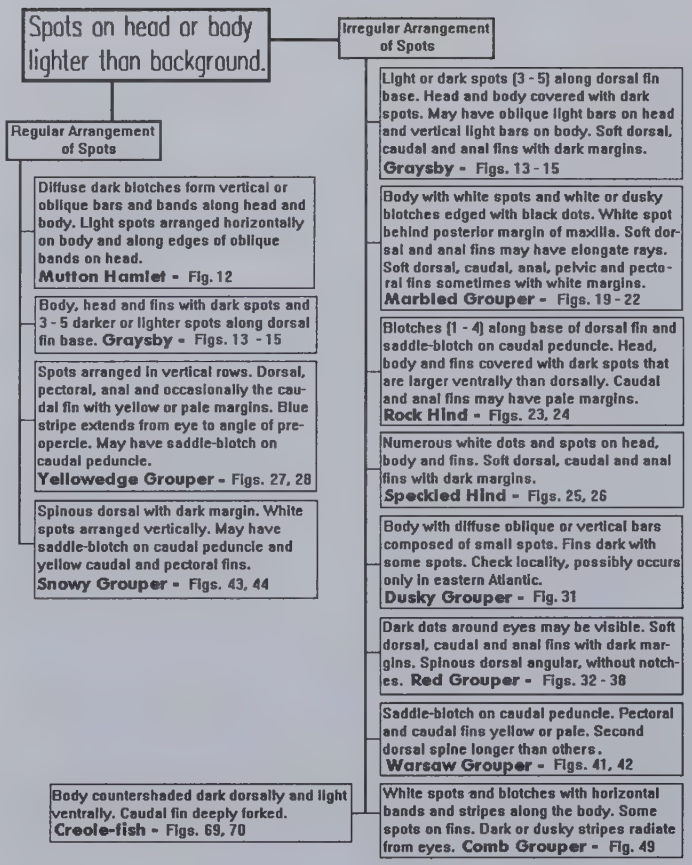
Spots on head or body lighter than background.
Irregular Arrangement of Spots
Light or dark spots (3 - 5) along dorsal fin base. Head and body covered with dark spots. May have oblique light bars on head and vertical light bars on body. Soft dorsal, caudal and anal fins with dark margins. Graysby - Figs. 13 - 15
Body with white spots and white or dusky blotches edged with black dots. White spot behind posterior margin of maxilla. Soft dorsal and anal fins may have elongate rays. Soft dorsal, caudal, anal, pelvic and pectoral fins sometimes with white margins. Marbled Grouper - Figs. 19 - 22
Blotches (1 - 4) along base of dorsal fin and saddle-blotch on caudal peduncle. Head, body and fins covered with dark spots that are larger ventrally than dorsally. Caudal and anal fins may have pale margins. Rock Hind - Figs. 23, 24
Numerous white dots and spots on head, body and fins. Soft dorsal, caudal and anal fins with dark margins. Speckled Hind - Figs. 25, 26
Body with diffuse oblique or vertical bars composed of small spots. Fins dark with some spots. Check locality, possibly occurs only in eastern Atlantic. Dusky Grouper - Fig. 31
Dark dots around eyes may be visible. Soft dorsal, caudal and anal fins with dark margins. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Saddle-blotch on caudal peduncle. Pectoral and caudal fins yellow or pale. Second dorsal spine longer than others. Warsaw Grouper - Figs. 41, 42
White spots and blotches with horizontal bands and stripes along the body. Some spots on fins. Dark or dusky stripes radiate from eyes. Comb Grouper - Fig. 49
Regular Arrangement of Spots
Diffuse dark blotches form vertical or oblique bars and bands along head and body. Light spots arranged horizontally on body and along edges of oblique bands on head. Mutton Hamlet - Fig. 12
Body, head and fins with dark spots and 3 - 5 darker or lighter spots along dorsal fin base. Graysby - Figs. 13 - 15
Spots arranged in vertical rows. Dorsal, pectoral, anal and occasionally the caudal fin with yellow or pale margins. Blue stripe extends from eye to angle of preopercle. May have saddle-blotch on caudal peduncle. Yellowedge Grouper - Figs. 27, 28
Spinous dorsal with dark margin. White spots arranged vertically. May have saddle-blotch on caudal peduncle and yellow caudal and pectoral fins. Snowy Grouper - Figs. 43, 44
Body countershaded dark dorsally and light ventrally. Caudal fin deeply forked. Creole-fish - Figs. 69, 70

Figure 8

Separation sheets for western Atlantic groupers (Serranidae) with spots on head or body lighter than background. See Contents or species accounts for scientific names.

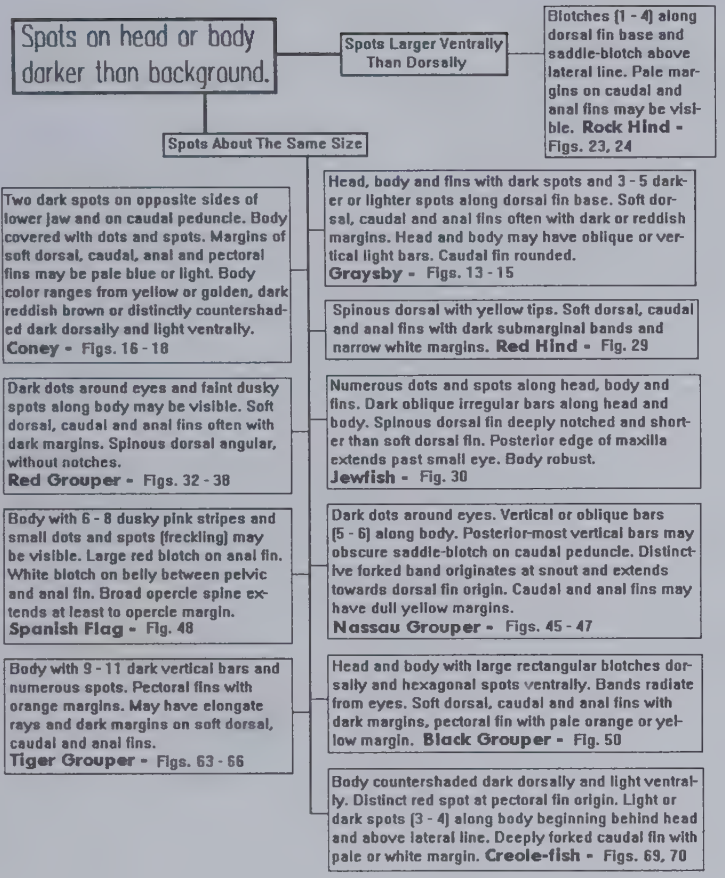
Spots on head or body darker than background.
Spots Larger Ventrally Than Dorsally
Blotches (1 - 4) along dorsal fin base and saddle-blotch above lateral line. Pale margins on caudal and anal fins may be visible. Rock Hind - Figs. 23, 24
Spots About The Same Size
Head, body and fins with dark spots and 3 - 5 darker or lighter spots along dorsal fin base. Soft dorsal, caudal and anal fins often with dark or reddish margins. Head and body may have oblique or vertical light bars. Caudal fin rounded. Graysby - Figs. 13 - 15
Two dark spots on opposite sides of lower jaw and on caudal peduncle. Body covered with dots and spots. Margins of soft dorsal, caudal, anal and pectoral fins may be pale blue or light. Body color ranges from yellow or golden, dark reddish brown or distinctly countershaded dark dorsally and light ventrally. Coney - Figs. 16 - 18
Spinous dorsal with yellow tips. Soft dorsal, caudal and anal fins with dark submarginal bands and narrow white margins. Red Hind - Fig. 29
Dark dots around eyes and faint dusky spots along body may be visible. Soft dorsal, caudal and anal fins often with dark margins. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Numerous dots and spots along head, body and fins. Dark oblique irregular bars along head and body. Spinous dorsal fin deeply notched and shorter than soft dorsal fin. Posterior edge of maxilla extends past small eye. Body robust. Jewfish - Fig. 30
Body with 6 - 8 dusky pink stripes and small dots and spots (freckling) may be visible. Large red blotch on anal fin. White blotch on belly between pelvic and anal fin. Broad opercle spine extends at least to opercle margin. Spanish Flag - Fig. 48
Dark dots around eyes. Vertical or oblique bars (5 - 6) along body. Posterior-most vertical bars may obscure saddle-blotch on caudal peduncle. Distinctive forked band originates at snout and extends towards dorsal fin origin. Caudal and anal fins may have dull yellow margins. Nassau Grouper - Figs. 45 - 47
Body with 9 - 11 dark vertical bars and numerous spots. Pectoral fins with orange margins. May have elongate rays and dark margins on soft dorsal, caudal and anal fins. Tiger Grouper - Figs. 63 - 66
Head and body with large rectangular blotches dorsally and hexagonal spots ventrally. Bands radiate from eyes. Soft dorsal, caudal and anal fins with dark margins, pectoral fin with pale orange or yellow margin. Black Grouper - Fig. 50
Body countershaded dark dorsally and light ventrally. Distinct red spot at pectoral fin origin. Light or dark spots (3 - 4) along body beginning behind head and above lateral line. Deeply forked caudal fin with pale or white margin. Creole-fish - Figs. 69, 70

Figure 9

Separation sheet for western Atlantic groupers (Serranidae) with spots on head or body darker than background. See Contents or species accounts for scientific names.

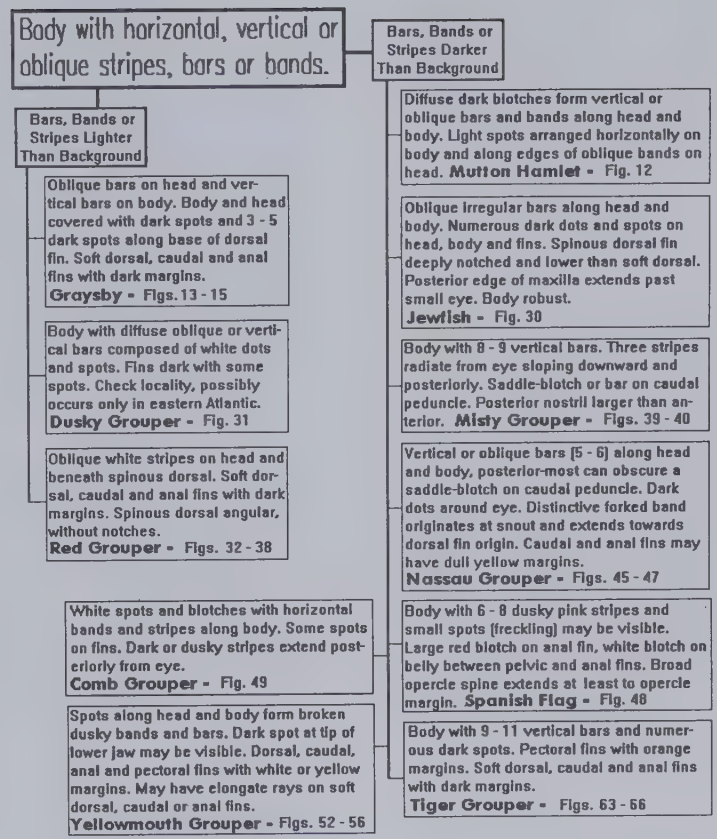
Body with horizontal, vertical or oblique stripes, bars or bands.
Bars, Bands or Stripes Darker Than Background
Diffuse dark blotches form vertical or oblique bars and bands along head and body. Light spots arranged horizontally on body and along edges of oblique bands on head. Mutton Hamlet - Fig. 12
Bars, Bands or Stripes Lighter Than Background
Oblique bars on head and vertical bars on body. Body and head covered with dark spots and 3 - 5 dark spots along base of dorsal fin. Soft dorsal, caudal and anal fins with dark margins. Graysby - Figs. 13 - 15
Oblique irregular bars along head and body. Numerous dark dots and spots on head, body and fins. Spinous dorsal fin deeply notched and lower than soft dorsal. Posterior edge of maxilla extends past small eye. Body robust. Jewfish - Fig. 30
Body with diffuse oblique or vertical bars composed of white dots and spots. Fins dark with some spots. Check locality, possibly occurs only in eastern Atlantic. Dusky Grouper - Fig. 31
Body with 8 - 9 vertical bars. Three stripes radiate from eye sloping downward and posteriorly. Saddle-blotch or bar on caudal peduncle. Posterior nostril larger than anterior. Misty Grouper - Figs. 39 - 40
Oblique white stripes on head and beneath spinous dorsal. Soft dorsal, caudal and anal fins with dark margins. Spinous dorsal angular, without notches. Red Grouper - Figs. 32 - 38
Vertical or oblique bars (5 - 6) along head and body, posterior-most can obscure a saddle-blotch on caudal peduncle. Dark dots around eye. Distinctive forked band originates at snout and extends towards dorsal fin origin. Caudal and anal fins may have dull yellow margins. Nassau Grouper - Figs. 45 - 47
White spots and blotches with horizontal bands and stripes along body. Some spots on fins. Dark or dusky stripes extend posteriorly from eye. Comb Grouper - Fig. 49
Body with 6 - 8 dusky pink stripes and small spots (freckling) may be visible. Large red blotch on anal fin, white blotch on belly between pelvic and anal fins. Broad opercle spine extends at least to opercle margin. Spanish Flag - Fig. 48
Spots along head and body form broken dusky bands and bars. Dark spot at tip of lower jaw may be visible. Dorsal, caudal, anal and pectoral fins with white or yellow margins. May have elongate rays on soft dorsal, caudal or anal fins. Yellowmouth Grouper - Figs. 52 - 56
Body with 9 - 11 vertical bars and numerous dark spots. Pectoral fins with orange margins. Soft dorsal, caudal and anal fins with dark margins. Tiger Grouper - Figs. 63 - 66

Figure 10

Separation sheet for western Atlantic groupers (Serranidae) with horizontal, vertical, or oblique stripes, bars, or bands along body. See Contents or species accounts for scientific names.

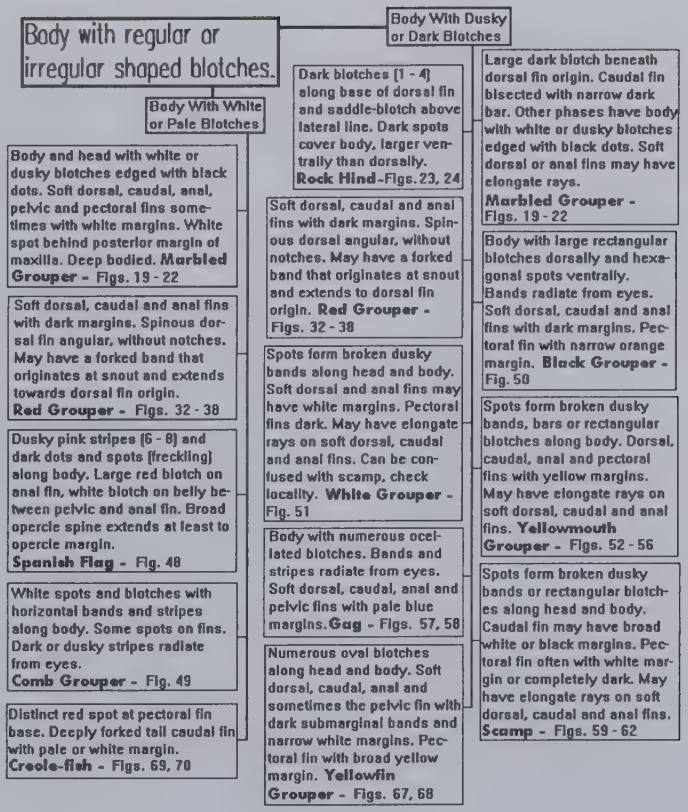
Body with regular or irregular shaped blotches.
Body With White or Pale Blotches
Body and head with white or dusky blotches edged with black dots. Soft dorsal, caudal, anal, pelvic and pectoral fins sometimes with white margins. White spot behind posterior margin of maxilla. Deep bodied. Marbled Grouper - Figs. 19 - 22
Soft dorsal, caudal and anal fins with dark margins. Spinous dorsal fin angular, without notches. May have a forked band that originates at snout and extends towards dorsal fin origin. Red Grouper - Figs. 32 - 38
Dusky pink stripes [6 - 8] and dark dots and spots [freckling] along body. Large red blotch on anal fin, white blotch on belly between pelvic and anal fin. Broad opercle spine extends at least to opercle margin. Spanish Flag - Fig. 48
White spots and blotches with horizontal bands and stripes along body. Some spots on fins. Dark or dusky stripes radiate from eyes. Comb Grouper - Fig. 49
Distinct red spot at pectoral fin base. Deeply forked tail caudal fin with pale or white margin. Creole-fish - Figs. 69, 70
Body With Dusky or Dark Blotches
Dark blotches [1 - 4] along base of dorsal fin and saddle-blotch above lateral line. Dark spots cover body, larger ventrally than dorsally. Rock Hind - Figs. 23, 24
Soft dorsal, caudal and anal fins with dark margins. Spinous dorsal angular, without notches. May have a forked band that originates at snout and extends to dorsal fin origin. Red Grouper - Figs. 32 - 38
Spots form broken dusky bands along head and body. Soft dorsal and anal fins may have white margins. Pectoral fins dark. May have elongate rays on soft dorsal, caudal and anal fins. Can be confused with scamp, check locality. White Grouper - Fig. 51
Body with numerous ocellated blotches. Bands and stripes radiate from eyes. Soft dorsal, caudal, anal and pelvic fins with pale blue margins. Gag - Figs. 57, 58
Numerous oval blotches along head and body. Soft dorsal, caudal, anal and sometimes the pelvic fin with dark submarginal bands and narrow white margins. Pectoral fin with broad yellow margin. Yellowfin Grouper - Figs. 67, 68
Large dark blotch beneath dorsal fin origin. Caudal fin bisected with narrow dark bar. Other phases have body with white or dusky blotches edged with black dots. Soft dorsal or anal fins may have elongate rays. Marbled Grouper - Figs. 19 - 22
Body with large rectangular blotches dorsally and hexagonal spots ventrally. Bands radiate from eyes. Soft dorsal, caudal and anal fins with dark margins. Pectoral fin with narrow orange margin. Black Grouper - Fig. 50
Spots form broken dusky bands, bars or rectangular blotches along body. Dorsal, caudal, anal and pectoral fins with yellow margins. May have elongate rays on soft dorsal, caudal and anal fins. Yellowmouth Grouper - Figs. 52 - 56
Spots form broken dusky bands or rectangular blotches along head and body. Caudal fin may have broad white or black margins. Pectoral fin often with white margin or completely dark. May have elongate rays on soft dorsal, caudal and anal fins. Scamp - Figs. 59 - 62

Figure 11

Separation sheet for western Atlantic groupers (Serranidae) with regular or irregular shaped blotches along body. See Contents or species accounts for scientific names.

Mutton Hamlet, *Alphestes afer*

Figure 12

Body varies from orange red to olive brown. Usually with diffuse dark brown blotches that form oblique or vertical bars and bands on head and body. Light dots and spots on body arranged in diffuse horizontal patterns and along the oblique bands and bars of the head. Dark bar on caudal peduncle extends below lateral line. Snout generally shorter than eye diameter. Caudal fin rounded. Preopercle serrated, the lower edge with a large spine that angles forward, which is sometimes hidden by skin. Maximum size: 31 cm. Range: western Atlantic, from Bermuda to Argentina, including the West Indies and the Caribbean. Similar in body shape to marbled grouper.

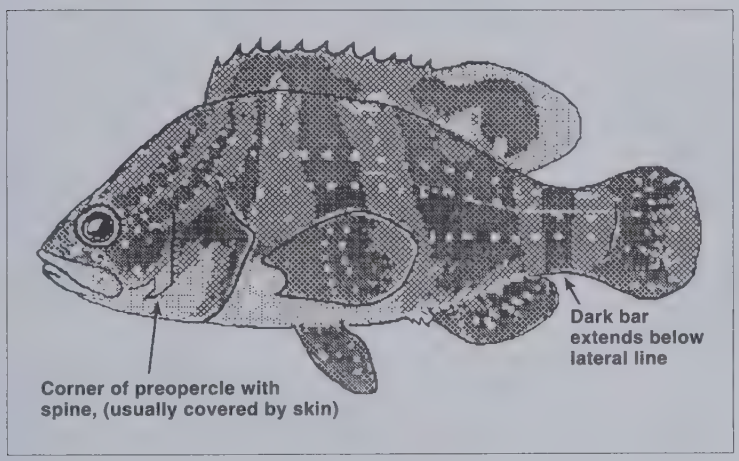

Figure 12
Mutton hamlet, *Alphestes afer*. Phase 1 of one, adult; drawn from a photograph by E. Gutherz (U.S. Dep. Commer., NOAA, NMFS, Southeast Fisheries Science Center, Pascagoula, MS, Unpubl. manuscr.)

Graysby, *Cephalopholis cruentata*

Figures 13–15

Body light (brown or gray) or dark with equally sized reddish brown spots on head and body. Usually 3–5 dark spots along dorsal-fin base. Occasionally reported with oblique light stripes or bands on head (one extending from the tip of the snout towards the dorsal-fin origin) and oblique bars on body. Soft dorsal, caudal, and anal fins often with reddish or dark margins. Dorsal spines nine. Caudal fin rounded. Maximum size: 31 cm. Range: western Atlantic, from Bermuda to the northern coast of South America, including the Gulf of Mexico and Caribbean. May be confused with the rock hind and red hind.

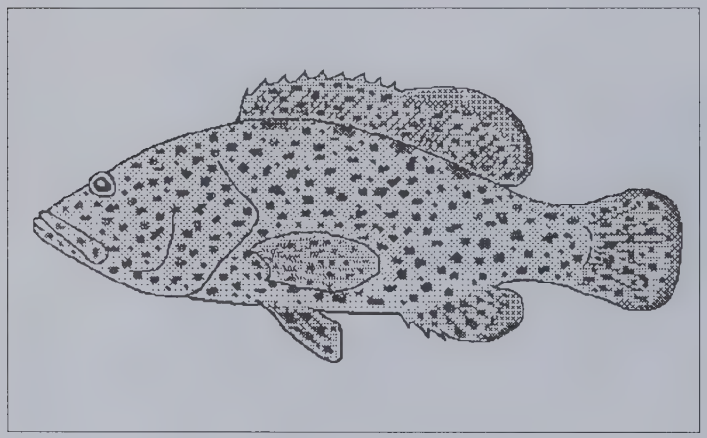

Figure 13
Graysby, *Cephalopholis cruentata.* Phase 1 of three, adult, light phase.

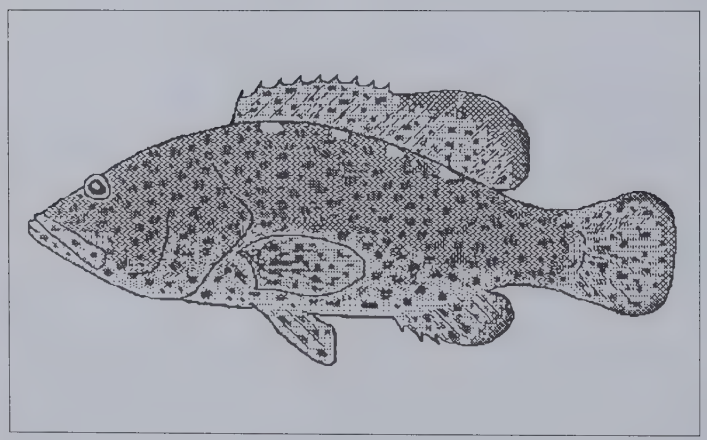

Figure 14
Graysby, *Cephalopholis cruentata.* Phase 2 of three, adult, dark phase.

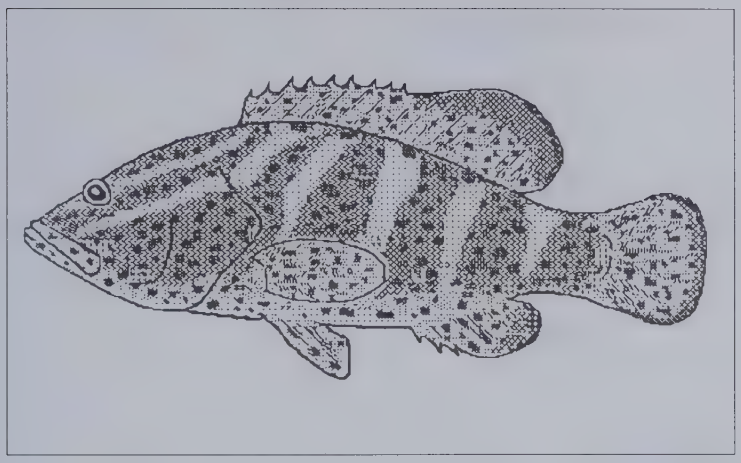

Figure 15
Graysby, *Cephalopholis cruentata*. Phase 3 of three, adult.

Coney, *Cephalopholis fulva*

Figures 16–18

Body color variable, countershaded dark dorsally and light ventrally, yellow, golden, or dark reddish brown. Head and body with dots and small dark-rimmed spots, which may be blue or occasionally white. Two dark spots always present on the caudal peduncle and on opposite sides of the tip of the lower jaw. "Sleep pattern" of irregular vertical bars and a forked band that runs from the snout towards the dorsal fin (Smith, 1971); this phase may be associated with anoxia or low light levels. Maximum size: 41 cm. Range: tropical western Atlantic, from Bermuda to Brazil, including the Gulf of Mexico.

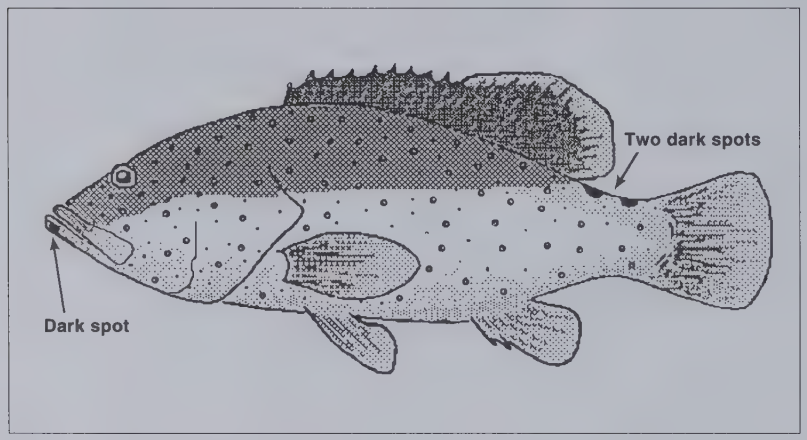

Figure 16
Coney, *Cephalopholis fulva.* Phase 1 of three, adult, countershaded.

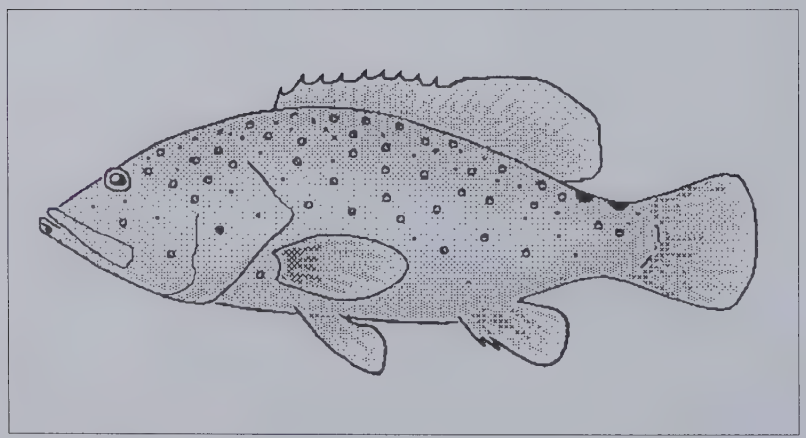

Figure 17
Coney, *Cephalopholis fulva.* Phase 2 of three, adult, yellow or golden phase.

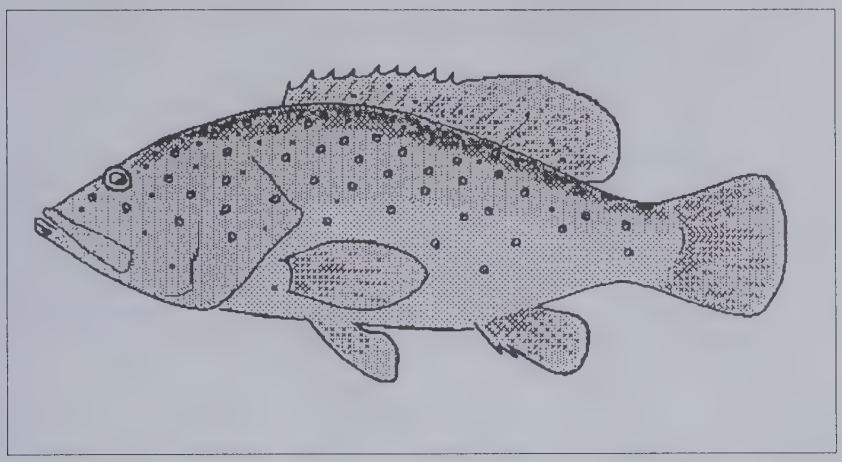

Figure 18
Coney, *Cephalopholis fulva.* Phase 3 of three, adult, dark phase.

Marbled Grouper, *Dermatolepis inermis*

Figures 19–22

Body brown to black with numerous dusky or white blotches edged with black dots. White spot behind posterior margin of maxilla may be visible (Smith, 1971). Light phase with a dark blotch at the top of the head and a dark bar that bisects the caudal fin. Other specimens with bodies completely dark and the soft dorsal, caudal, anal, pelvic, and pectoral fins with white or pale margins. May have elongate rays on soft dorsal and anal fins. Caudal fin rounded in young, becoming truncate or concave in adults. Pectoral fin large. Head profile steeper than in other groupers. Maximum size: 91 cm. Range: tropical western Atlantic. Similar in body shape to mutton hamlet, but maxilla does not extend past posterior margin of eye.

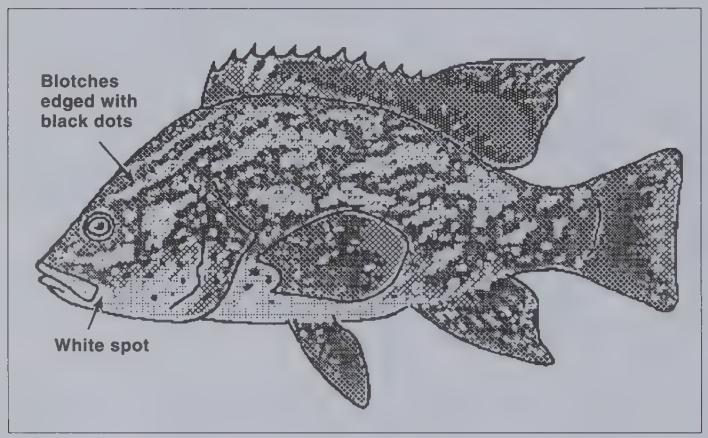

Figure 19
Marbled grouper, *Dermatolepis inermis*. Phase 1 of four, adult.

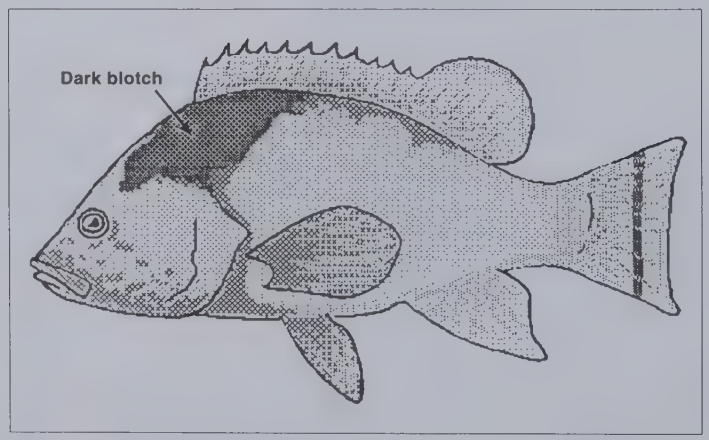

Figure 20
Marbled grouper, *Dermatolepis inermis*. Phase 2 of four, adult, light phase.

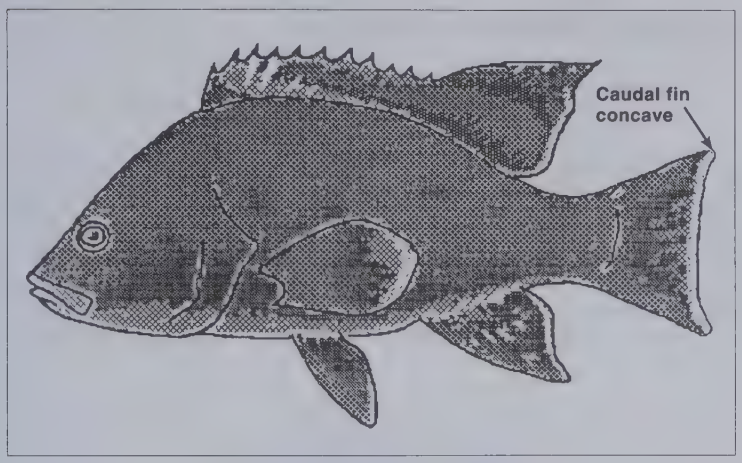

Figure 21
Marbled grouper, *Dermatolepis inermis*. Phase 3 of four, adult, dark phase.

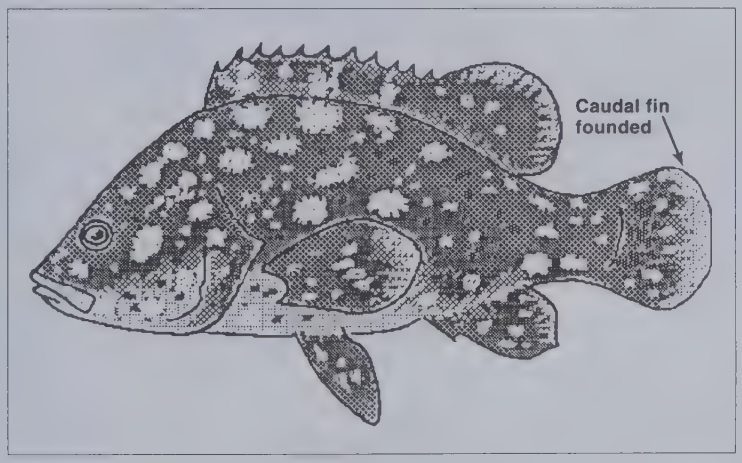

Figure 22
Marbled grouper, *Dermatolepis inermis*. Phase 4 of four, juvenile.

Rock Hind, *Epinephelus adscensionis*

Figures 23 and 24

Body dusky or pale brown with numerous reddish brown spots on head, body, and fins. Spots usually larger ventrally. Dark blotches (1–4) along the dorsal-fin base, with a saddle-blotch that does not extend below the lateral line on the caudal peduncle. White spots on body may be present. Dusky phase with broad mottled oblique blotches. Posterior edges of caudal and anal fins may have pale margins. Some specimens have a thin dark margin on posterior edges of dorsal and caudal fins; however, this feature is not common in this species. Tips of spinous dorsal fin yellow. Maximum size: 61 cm. Range: central western Atlantic, including the Gulf of Mexico and the Caribbean. May also occur in the eastern Atlantic (Smith, 1971). May be confused with the red hind.

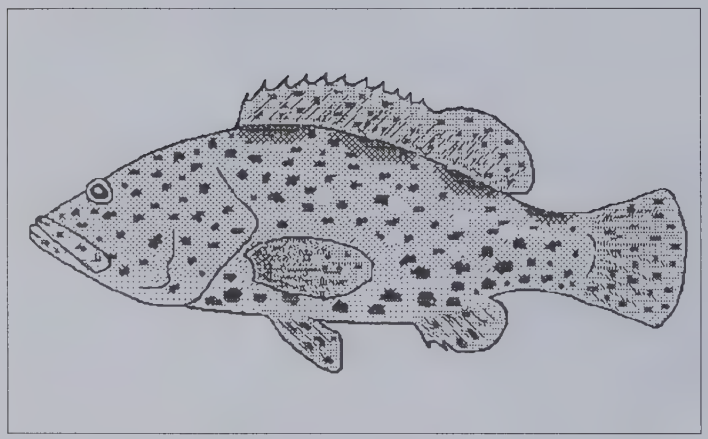

Figure 23
Rock hind, *Epinephelus adscensionis*. Phase 1 of two, adult, light phase.

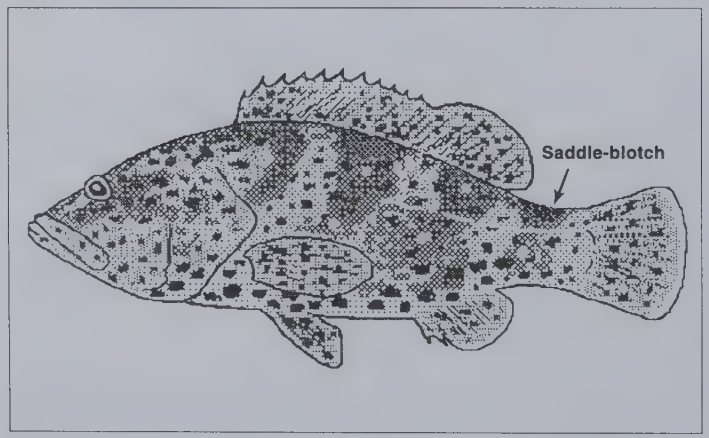

Figure 24
Rock hind, *Epinephelus adscensionis*. Phase 2 of two, adult, dusky phase.

Speckled Hind, *Epinephelus drummondhayi*

Figures 25 and 26

Body tan to dark reddish brown with numerous white dots and spots on head, body, and fins. Juveniles may be xanthic (Bullock and Smith, 1991) and occasionally have two or three pale areas below the dorsal fin. Soft dorsal, caudal, and anal fins may have dark outer margins. Preopercle serrated. Maximum size: up to 102 cm. Range: western Atlantic, from Bermuda to south Florida, including the northern Gulf of Mexico. Body more compressed than rock hind or red hind.

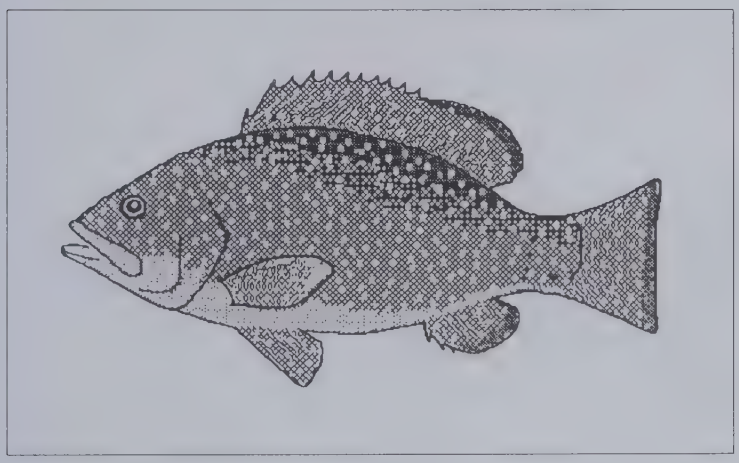

Figure 25
Speckled hind, *Epinephelus drummondhayi.* Phase 1 of two, adult.

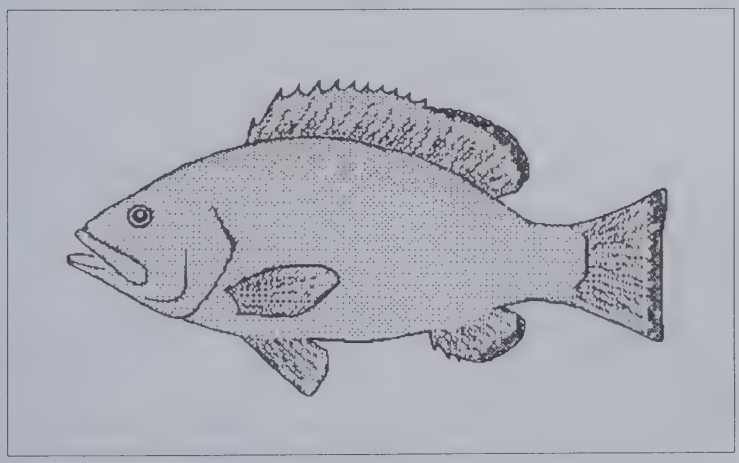

Figure 26
Speckled hind, *Epinephelus drummondhayi.* Phase 2 of two, juvenile. Drawn from photograph (Bullock and Smith, 1991).

Yellowedge Grouper, *Epinephelus flavolimbatus*

Figures 27 and 28

Body generally reddish brown or tan. A blue stripe may extend from the eye to the angle of the preopercle. Juveniles usually have a saddle-blotch that does not extend below the lateral line on the caudal peduncle. White spots arranged in vertical rows along the body and dorsal fin common in juveniles and, sometimes, adults. Dorsal, pectoral, anal, and, occasionally, caudal fins with yellow or pale margins in both juveniles and adults. A distinct yellow spot sometimes between the second and third dorsal spines.[5] Iris bright yellow. Pelvic fin usually dark. Maximum size: 76 cm. Range: western Atlantic, from Bermuda to Brazil, including the Gulf of Mexico and Caribbean. Juveniles may be confused with snowy and warsaw groupers.

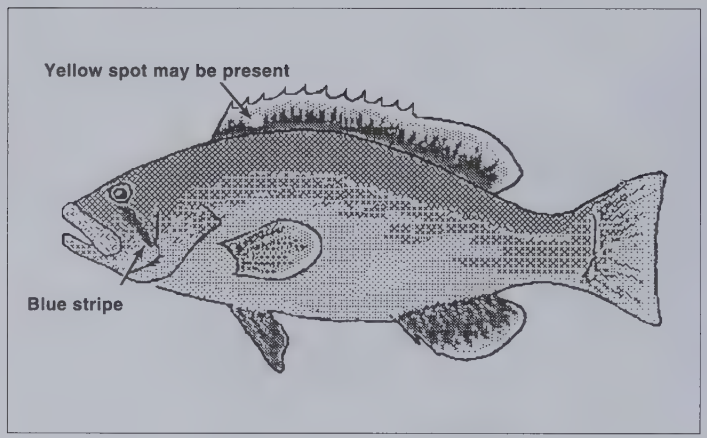

Figure 27
Yellowedge grouper, *Epinephelus flavolimbatus*. Phase 1 of two, adult.

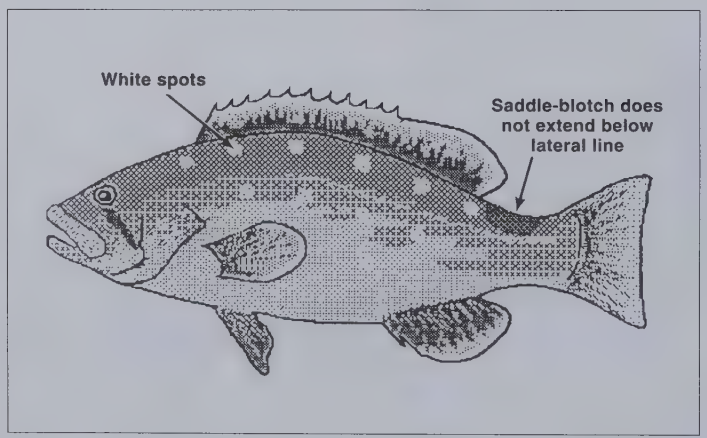

Figure 28
Yellowedge grouper, *Epinephelus flavolimbatus*. Phase 2 of two, juvenile.

[5] Gutherz, E., U.S. Dep. Commer., NOAA, NMFS, Southeast Fisheries Science Center, Pascagoula, MS, unpubl. manuscr.

Red Hind, *Epinephelus guttatus*

Figure 29

Body usually reddish brown with numerous dark red spots on head and body. Ventral and dorsal spots of same size. Spinous dorsal fin may be tipped with yellow. Soft dorsal, caudal, and anal fins have broad submarginal dark bands with narrow white margins. No large dark areas along base of dorsal fin or on caudal peduncle. A juvenile (5 cm) similar in appearance to adults but without dark submarginal bands has been reported.[3] Maximum size: 71 cm. Range: central western Atlantic, from Bermuda to the north coast of South America, including the Caribbean and the Gulf of Mexico. May be confused with the rock hind.

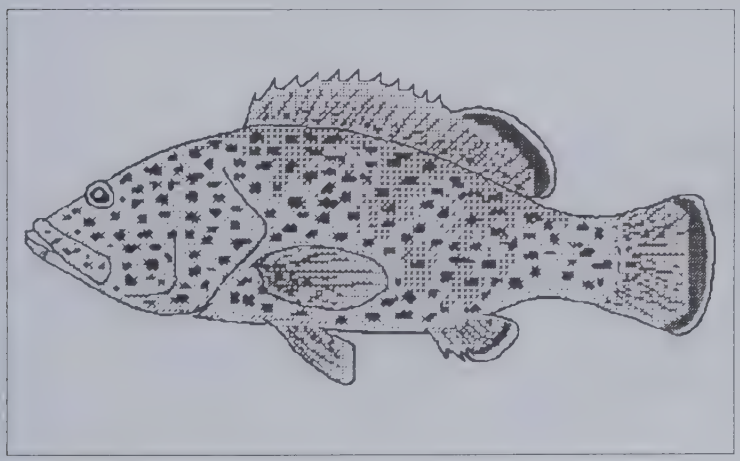

Figure 29
Red hind, *Epinephelus guttatus*. Phase 1 of one, adult.

Jewfish, *Epinephelus itajara*

Figure 30

Body generally yellowish brown to olive. May have oblique irregular bars along head and body, and small dark dots and spots on head, body, and fins. Oblique bars and spotting more evident in young. Spinous dorsal fin deeply notched and much lower than soft dorsal fin. Body generally robust. Posterior edge of maxilla extends past small eye. Caudal fin rounded. The jewfish is the largest western Atlantic grouper. Juveniles may be found in mangrove swamp areas (Bullock and Smith, 1991). Maximum size: 213 cm (309 kg) (Randall, 1968). Range: eastern Pacific and tropical western Atlantic, including the Gulf of Mexico. Large specimens sometimes confused with warsaw groupers. Species account compiled from Bullock and Smith (1991), Hoese and Moore (1977), Randall (1968), Robins et al. (1986), and Smith (1971 and 1978).

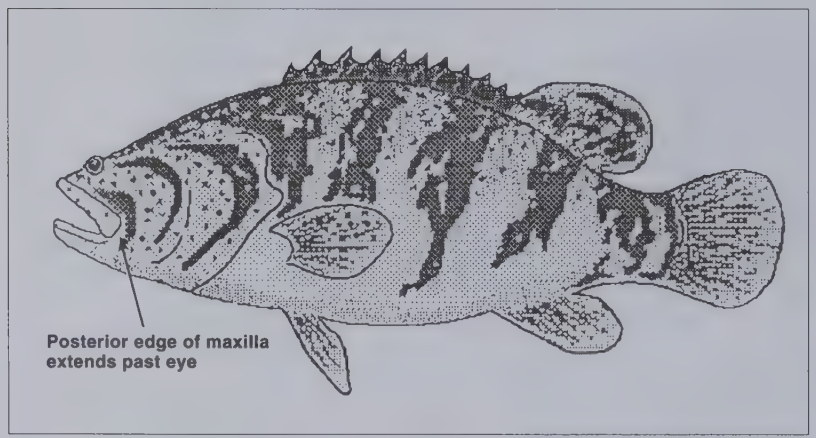

Figure 30
Jewfish, *Epinephelus itajara.* Phase 1 of one, adult. Drawn in part from a photograph (Randall, 1968).

Dusky Grouper, *Epinephelus marginatus*

Figure 31

Body dark grey, reddish brown, or dark purple. Scattered diffuse white dots and spots may form oblique or vertical bars on body. Large adults generally uniformly dark brown with a gray yellow belly. Caudal and anal fins with white margins. Fins generally dark with some white spots. Maximum size: 122 cm and 45 kg. Range: common along the west coast of Africa and southern Brazil; distributional reports from the western North Atlantic, Bermuda, and the Gulf of Mexico may confuse this species with other superficially similar groupers. Current convention (Heemstra and Randall, 1993) does not include the dusky grouper in the western North Atlantic, though its occurrence has been previously documented by Osaka (1976) and Smith (1981). Species account compiled from Heemstra (1991), Rivas (1964), and Smith (1981).

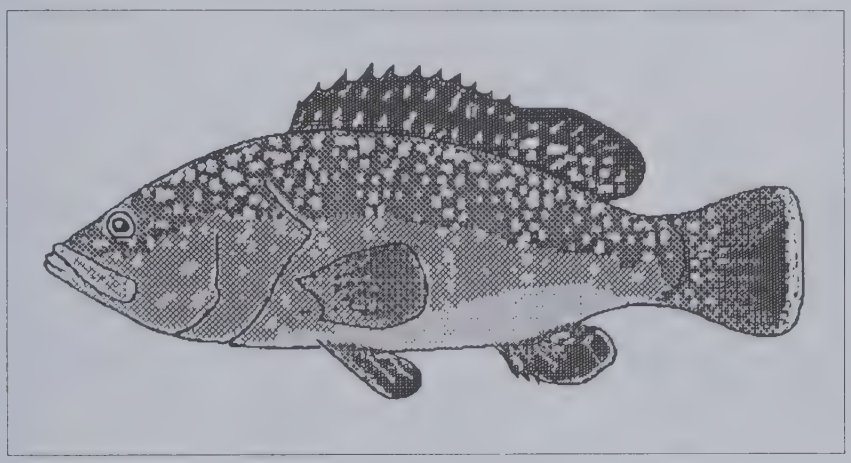

Figure 31
Dusky grouper, *Epinephelus marginatus*. Phase 1 of one, adult. Redrawn in part from Smith (1981).

Red Grouper, *Epinephelus morio*

Figures 32–38

Body reddish brown or dusky and may have light or dark spots, stripes, bars, or blotches. A dark phase possesses oblique white stripes on head or large white blotches posteriorly. Light phases may be brownish or gray and may exhibit faint spotting along the body or mottled vertical blotches. The blotched and banded phase closely resembles the markings of the Nassau grouper, with similar body patterns and a forked band that originates on the snout. Dark dots around eyes may be present. May have dark margins along the soft dorsal, caudal, and anal fins; the caudal fin may be dark submarginally with a narrow white margin. Frequently, especially in juveniles, a dark or dusky stripe originates at the snout and continues through the eye towards the dorsal-fin origin. Inside of mouth scarlet red. Spinous dorsal fin high and angular without notches between spines. Elongate rays may be present at the upper angle of the caudal fin. Angle of preopercle serrated. Juveniles occur in seagrass beds and offshore reefs.[2] Maximum size: 107 cm. Range: western Atlantic from New England to Brazil, including the Gulf of Mexico.

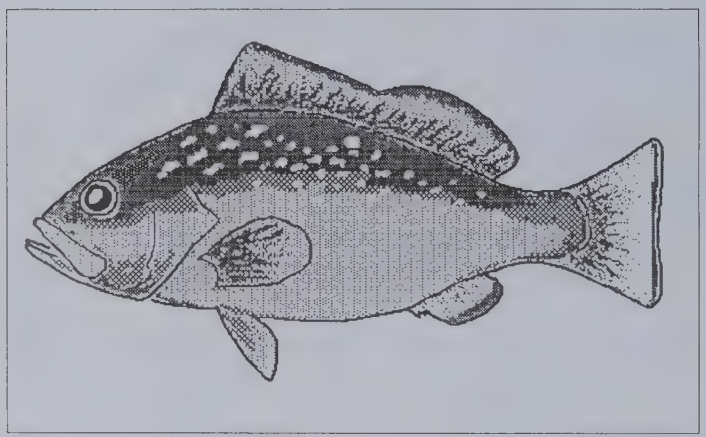

Figure 32
Red grouper, *Epinephelus morio*. Phase 1 of six, adult, dark phase with white spots.

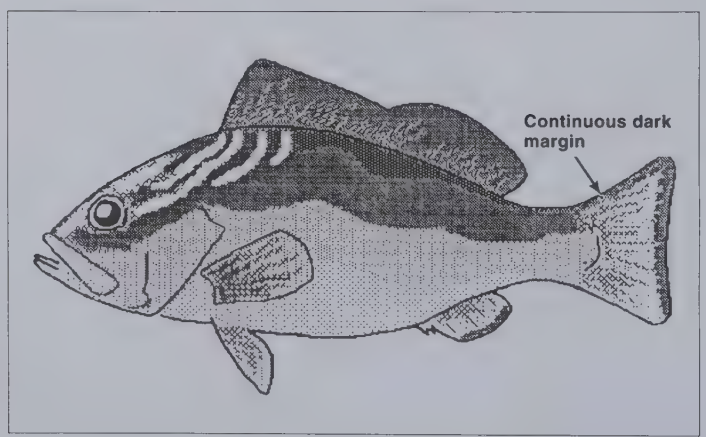

Figure 33
Red grouper, *Epinephelus morio*. Phase 2 of six, adult, dark phase with oblique white stripes.

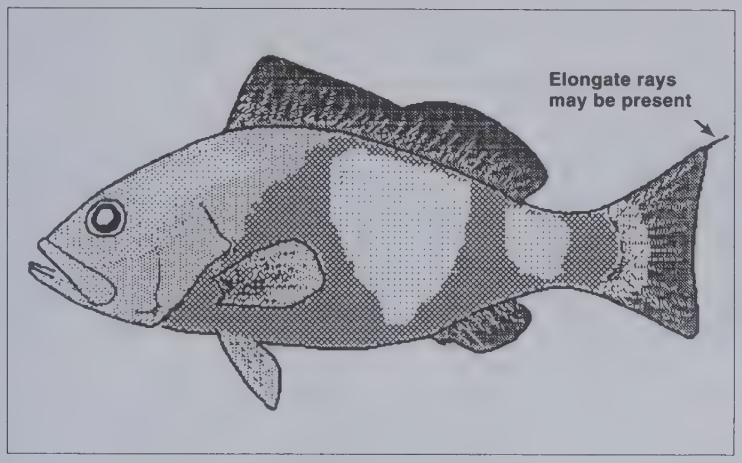

Figure 34
Red grouper, *Epinephelus morio.* Phase 3 of six, adult, dark phase with white blotches.

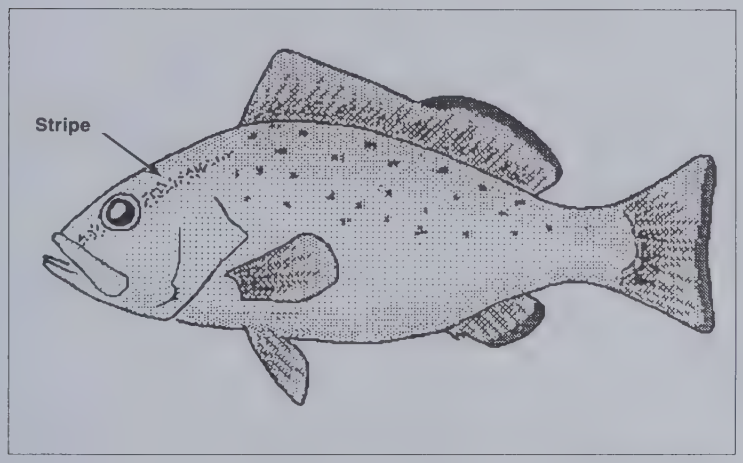

Figure 35
Red grouper, *Epinephelus morio.* Phase 4 of six, adult, light phase with faint spots.

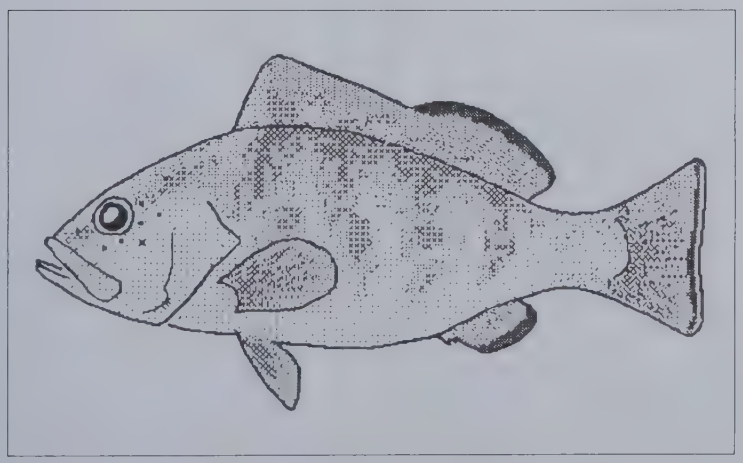

Figure 36
Red grouper, *Epinephelus morio.* Phase 5 of six, adult, light mottled phase.

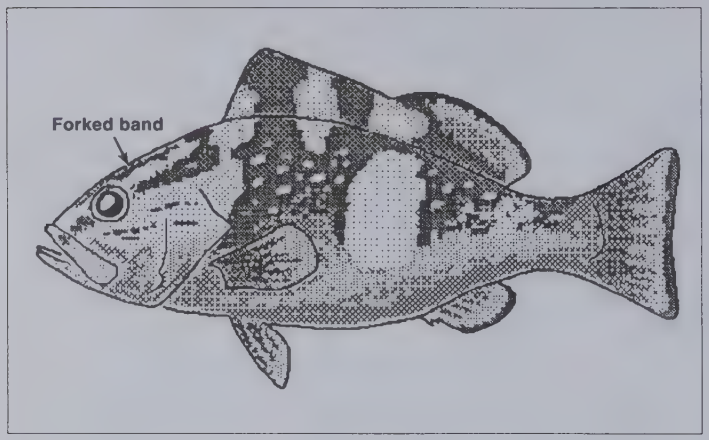

Figure 37
Red grouper, *Epinephelus morio.* Phase 6 of six, adult, blotched and banded.

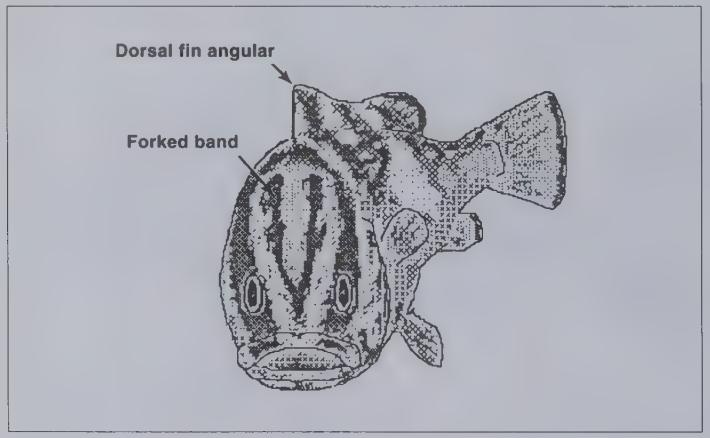

Figure 38
Red grouper, *Epinephelus morio.* Phase 6 of six, adult, front view.

Misty Grouper, *Epinephelus mystacinus*

Figures 39 and 40

Body usually pale gray or brown, with 7–10 dark vertical bars along head and body. Three stripes or bands radiate from the eye, sloping downward and posteriorly. Posterior nostril much larger than anterior nostril in adults. Young similar to adults but with saddle-blotch on the caudal peduncle instead of the dark bar in adults. Both dark saddle and dark bar extend below lateral line. A black mark (moustache) above the maxillary may be noticeable. Preopercle angular. Maximum size: 152 cm (55 kg). Range: western Atlantic, from Bermuda to Brazil and the Caribbean. May be confused with red and Nassau groupers. Species account compiled from Bullock and Smith (1991), Rivas (1964), Robins et al. (1986), and Smith (1971 and 1978).

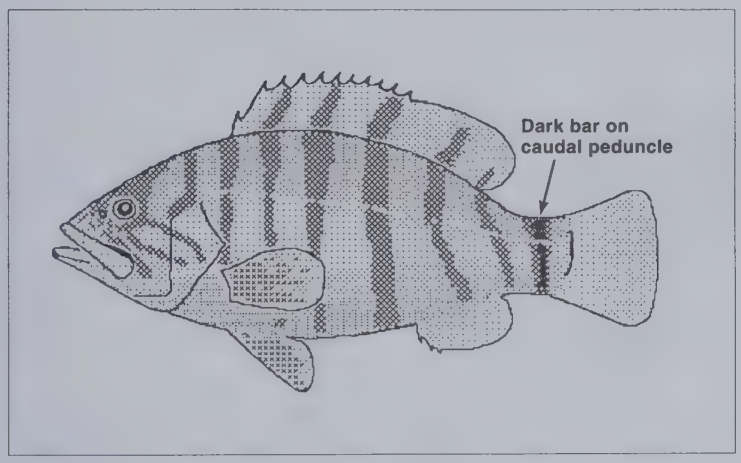

Figure 39
Misty grouper, *Epinephelus mystacinus*. Phase 1 of two, adult. Redrawn in part from Robins et al. (1986).

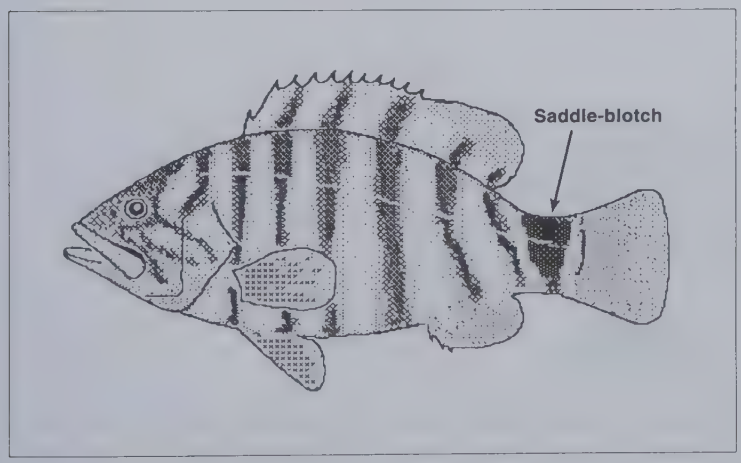

Figure 40
Misty grouper, *Epinephelus mystacinus*. Phase 2 of two, juvenile. Drawn from a photograph (Bullock and Smith, 1991).

Warsaw Grouper, *Epinephelus nigritus*

Figures 41 and 42

Body uniformly dark and usually without distinct markings. Juveniles may have yellowish caudal and pectoral fins with some irregular white spots on body. Juveniles with a saddle-blotch on the caudal peduncle that does not extend below lateral line (Robins et al., 1986). The warsaw grouper is the only grouper found in the western central Atlantic with 10 dorsal spines instead of 11. Generally, the second dorsal spine is considerably longer than the others in specimens greater than 40 cm (Bullock and Smith, 1991). Maximum size: 183 cm (264 kg). Range: tropical and subtropical western Atlantic, from Massachusetts to Brazil, including the Caribbean and the Gulf of Mexico. Large adults may be confused with jewfish; juveniles, with snowy or yellowedge groupers.

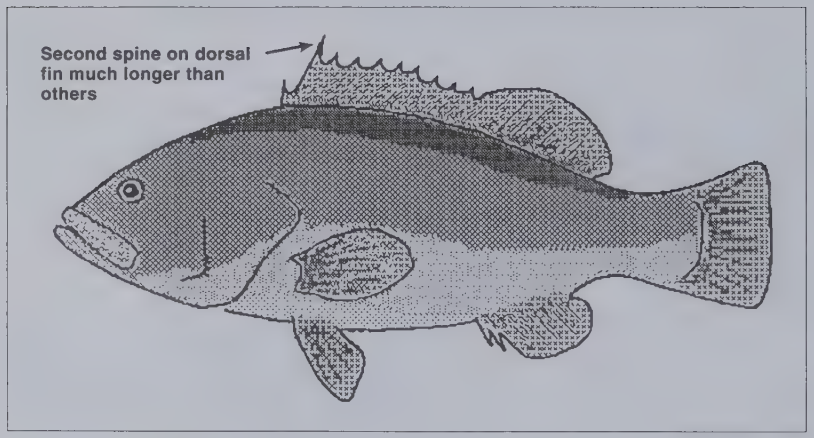

Figure 41
Warsaw grouper, *Epinephelus nigritus*. Phase 1 of two, adult.

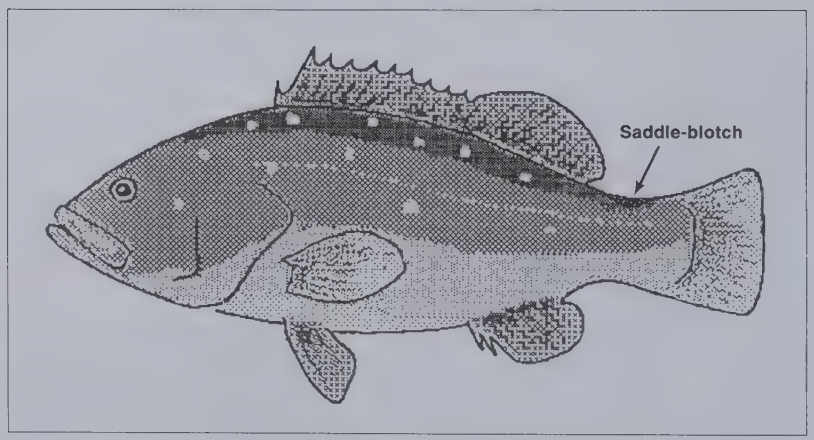

Figure 42
Warsaw grouper, *Epinephelus nigritus*. Phase 2 of two, juvenile.

Snowy Grouper, *Epinephelus niveatus*

Figures 43 and 44

Adults light colored with dusky or faint spots in vertical rows along the head, body, and dorsal fin. Dark margin on the spinous dorsal and dark moustache above the maxilla usually visible. Juveniles with brown or dark gray body, distinct white spots arranged in vertical rows, and yellow caudal and pectoral fins. Juveniles with a saddle-blotch on caudal peduncle that extends below lateral line; saddle-blotch less distinct or absent in adults. Posterior nostril 3 to 5 times larger than anterior nostril. Maximum size: 91 cm. Range: western Atlantic, from Massachusetts to Brazil. Juveniles can be confused with juvenile yellowedge groupers.

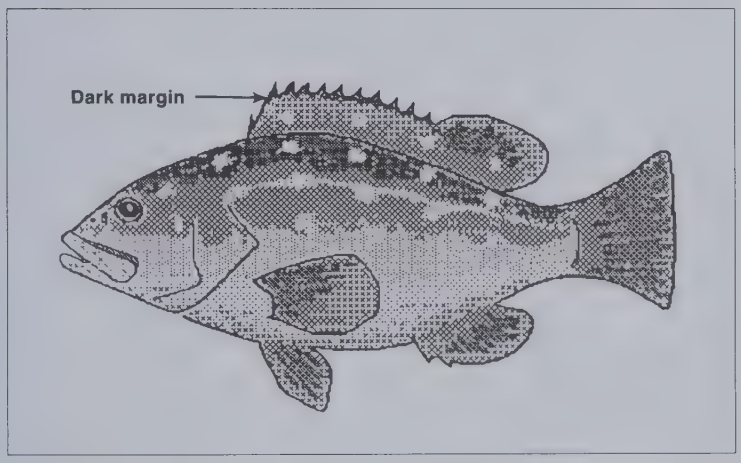

Figure 43
Snowy grouper, *Epinephelus niveatus*. Phase 1 of two, adult.

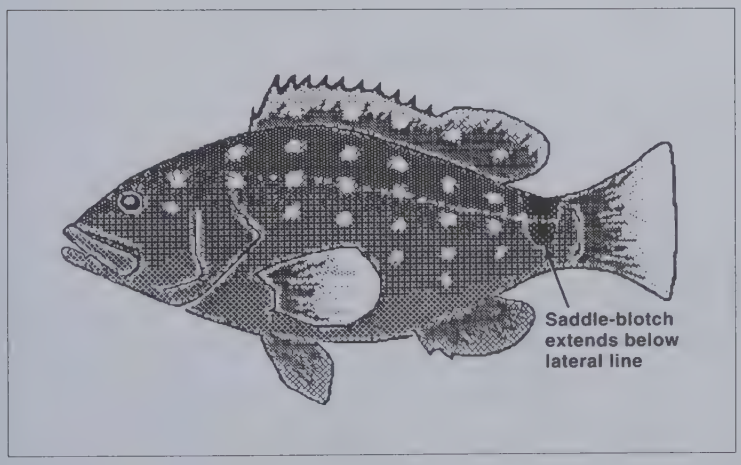

Figure 44
Snowy grouper, *Epinephelus niveatus*. Phase 2 of two, juvenile.

Nassau Grouper, *Epinephelus striatus*

Figures 45–47

Body varies from almost completely white to almost totally black. Head and body with 5–6 dark olive brown vertical bars. Dark dots and spots present around eye. Saddle-blotch above lateral line sometimes obscured by dark bar. Third and fourth bars on posterior half of body often connected with a horizontal band. Dull yellow margins may be present on anal and caudal fins. Tips of spinous dorsal may be yellow. Usually a distinct band, shaped like a tuning-fork, begins on the snout and extends towards the dorsal-fin origin. In addition, the head may have an oblique bar that originates on the snout and extends through the eye towards the dorsal-fin origin. A countershaded spawning phase has been reported.[6] Third dorsal spine longest. Maximum size: 91 cm (25 kg). Range: western Atlantic, from Bermuda to the north coast of South America, including most of the Caribbean and the Gulf of Mexico. Juveniles may be found in seagrass beds (Randall, 1968). May be confused with the red and misty groupers.

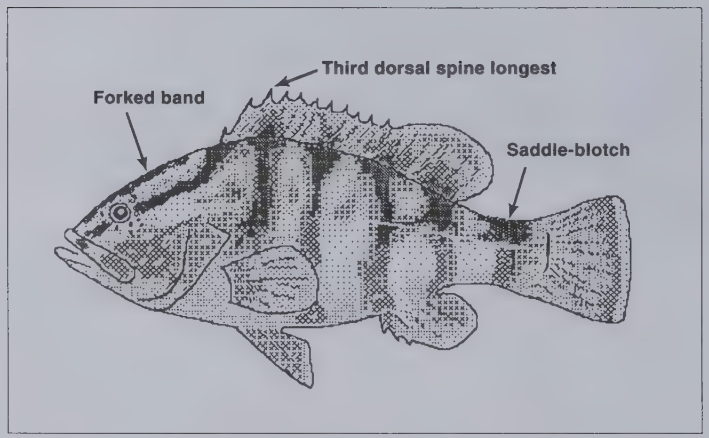

Figure 45
Nassau grouper, *Epinephelus striatus*. Phase 1 of two, adult.

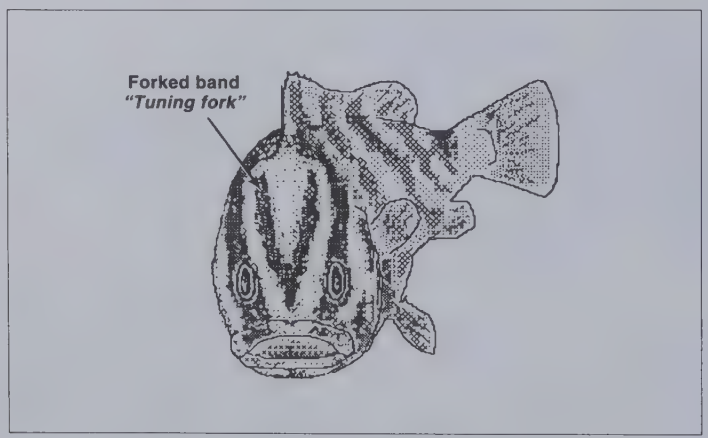

Figure 46
Nassau grouper, *Epinephelus striatus*. Front view, adult.

[6] Bush, P., Natural Resources Unit, Cayman Islands, British West Indies. Personal commun., November 1992.

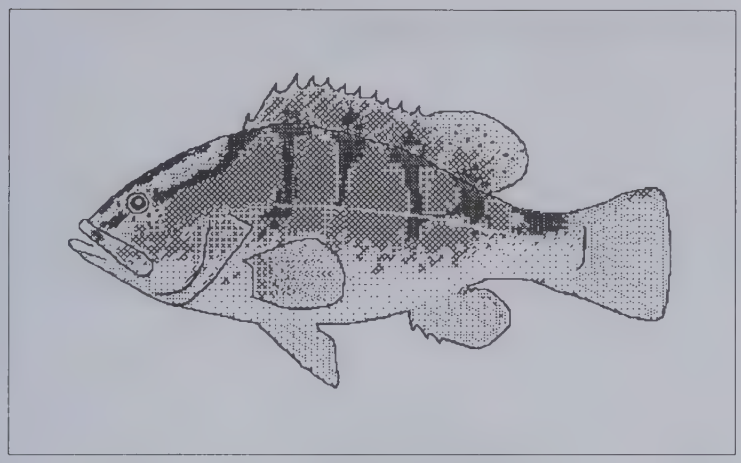

Figure 47
Nassau grouper, *Epinephelus striatus*. Phase 2 of two, adult, countershaded spawning phase. Drawn from a photograph (see text footnote 6).

Spanish Flag, *Gonioplectrus hispanus*

Figure 48

Body yellow with 6–8 dusky pink stripes on body and another stripe along dorsal fin. Dorsal fin yellow with a horizontal stripe. Anal fin with a large red blotch at base. Dark dots and spots (freckling) may be present along the body.[7] Belly with a white blotch between pelvic and anal fins. A broad opercular spine usually extends to and sometimes beyond opercular margin. Compared with other groupers, its body appears deeper and less tapered between soft dorsal and anal fins. Maximum size: 31 cm. Range: western North Atlantic, from North Carolina to Venezuela, including most of the eastern Caribbean and Gulf of Mexico.

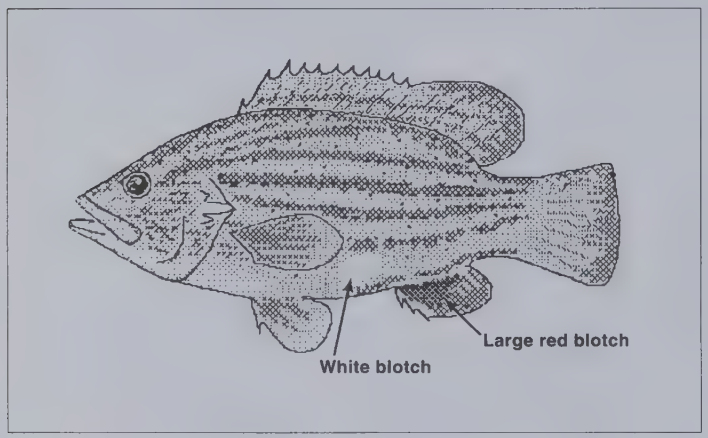

Figure 48
Spanish flag, *Gonioplectrus hispanus*. Phase 1 of one, adult. Drawn from a photograph (see text footnote 7).

[7] Rohr, B., U.S. Dep. Commer., NOAA, NMFS, Southeast Fisheries Science Center, Pascagoula, MS, unpubl. manuscr.

Comb Grouper, *Mycteroperca acutirostris*

Figure 49

Body reddish brown or gray with white spots, blotches, and broken horizontal dark stripes and bands. Dark or dusky stripes radiate from eye. May have a pale stripe that begins on the snout and continues toward the dorsal-fin origin. Light spots on fins. Some adults uniformly gray. Markings boldest in young. Caudal-fin shape changes from truncate to emarginate to concave as the fish matures (Randall, 1968). Maximum size: 61 cm. Range: western Atlantic, from Bermuda to Brazil, including the Caribbean and the Gulf of Mexico.

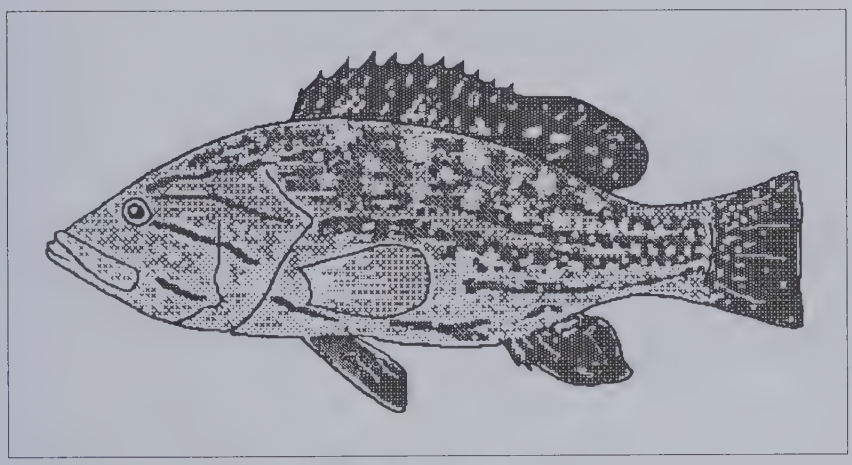

Figure 49
Comb grouper, *Mycteroperca acutirostris*. Phase 1 of one, adult.

Black Grouper, *Mycteroperca bonaci*

Figure 50

Body varies from light tan to reddish black or very pale. Head and body with rectangular blotches dorsally and hexagonal bronze spots on the head and along the ventral side. Dark or dusky bands composed of small spots radiate from eye. Soft dorsal, caudal, and anal fins have submarginal black or dark blue bands with narrow white margins. Pectoral fin with pale orange or yellow margin. Juveniles are similar to adults but with lighter markings. Preopercle is rounded and without a distinct notch. Maximum size: 122 cm (82 kg). Range: central western Atlantic, from Massachusetts and south from Bermuda to Brazil, including the West Indies, Caribbean, and Gulf of Mexico.

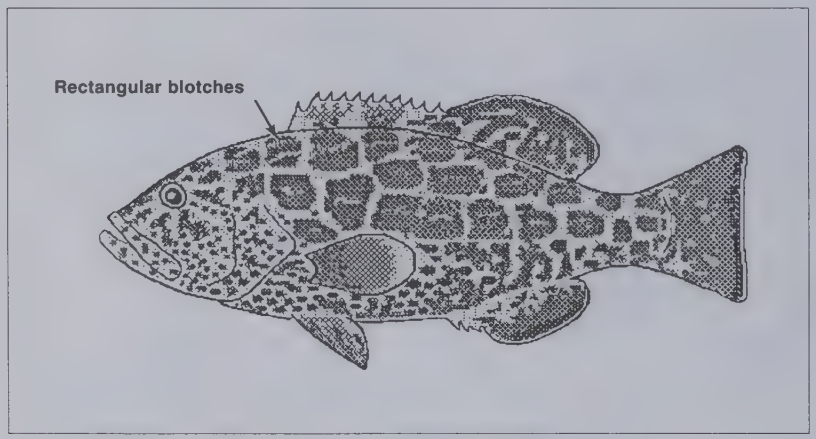

Figure 50
Black grouper, *Mycteroperca bonaci*.
Phase 1 of one, adult.

White Grouper, *Mycteroperca cidi*

Figure 51

Body with dusky spots forming broken bands and blotches. Often nearly white when first landed. Some adults uniformly brown. Young specimens generally gray or greenish brown and may have irregular brown spots on body. Soft dorsal and anal fins may have dark submarginal bands with white margins. Soft dorsal, caudal, and soft anal fins sometimes with elongate rays extending past margin. Caudal fin in juveniles emarginate. Distinct notch on preopercle above serrated lobe at angle. Maximum size: 114 cm. Range: western Atlantic, along the coast of Venezuela and the southern West Indies. May be confused with the scamp and yellowmouth grouper. Species account compiled from Cervigon and Valasquez (1966), Randall (1968), and Smith (1978).

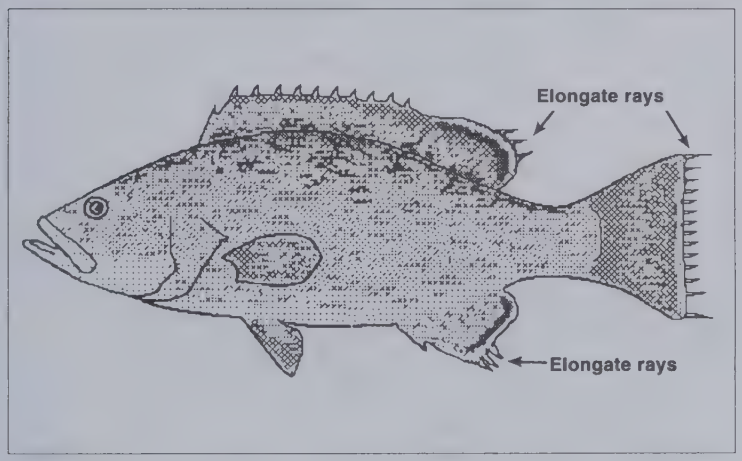

Figure 51
White grouper, *Mycteroperca cidi*. Phase 1 of one, adult. Drawn in part from a photograph (Cervigon and Valasquez, 1966).

Yellowmouth Grouper, *Mycteroperca interstitialis*

Figures 52–56

Body brown with numerous dusky spots that form broken bands and blotches along head and body. These bands and blotches may form a series of wide bars that extend along the upper half of the body. Blotches occasionally very dark and rectangular, arranged horizontally along head, body, and dorsal fin (Humann, 1989). Dorsal, caudal, anal, and pectoral fins typically with a yellow or white margin. In juveniles the body may be sharply countershaded (black dorsally and cream-colored ventrally) and the tip of the lower jaw may have a black spot. Juveniles may also exhibit a spotting pattern similar to adults but with a dark spot at the upper caudal-fin base (Bullock and Smith, 1991). Yellow area inside and at corners of the mouth. In adults the soft dorsal, anal, and caudal fins may have elongate fin rays; in the caudal fin, elongate rays are usually uniform in length. Caudal fin emarginate or slightly convex. Angle of preopercle with serrated lobe and distinct notch above. Maximum size: 76 cm (18 kg). Range: central western Atlantic, from Bermuda to Brazil, including the southern Gulf of Mexico and West Indies. Juveniles may be confused with the scamp and white grouper.

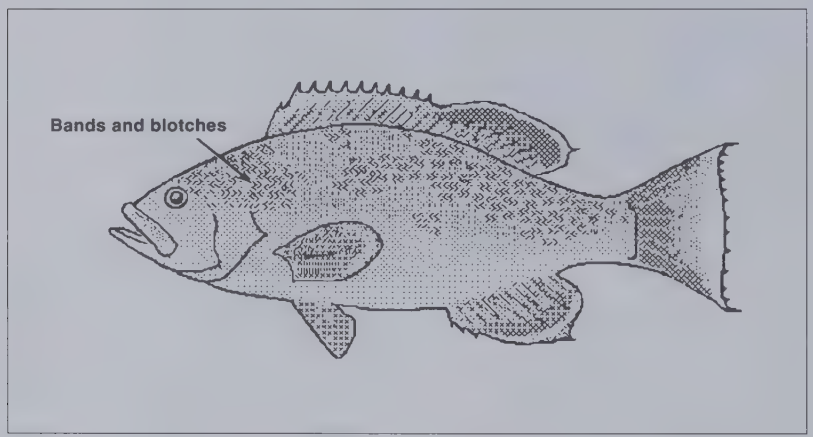

Figure 52
Yellowmouth grouper, *Mycteroperca interstitialis*. Phase 1 of five, adult with spots forming bands.

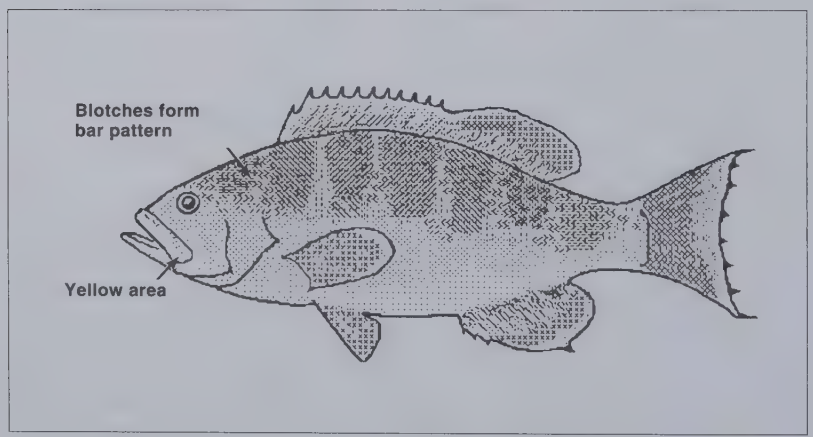

Figure 53
Yellowmouth grouper, *Mycteroperca interstitialis*. Phase 2 of five, adult with bar pattern.

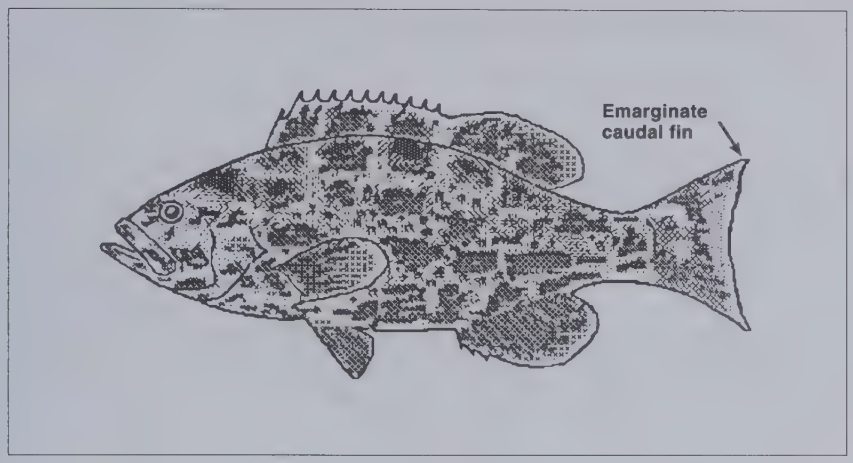

Figure 54
Yellowmouth grouper, *Mycteroperca interstitialis*. Phase 3 of five, adult with dark blotches. Redrawn from Humann (1989).

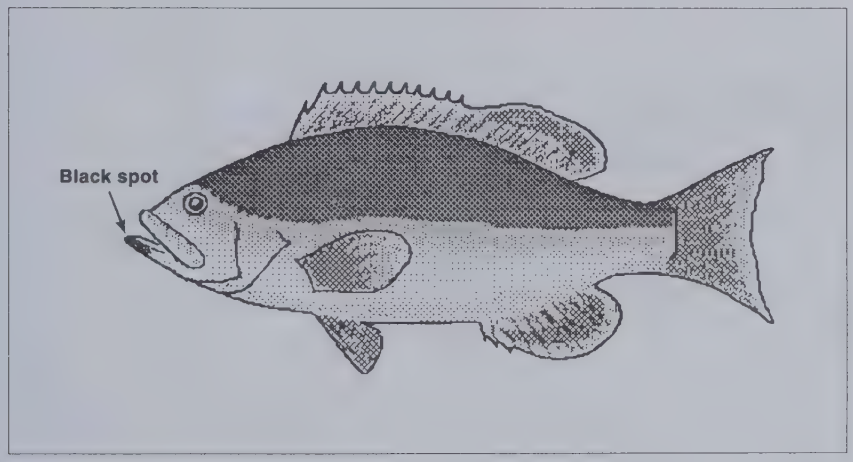

Figure 55
Yellowmouth grouper, *Mycteroperca interstitialis*. Phase 4 of five, countershaded juvenile.

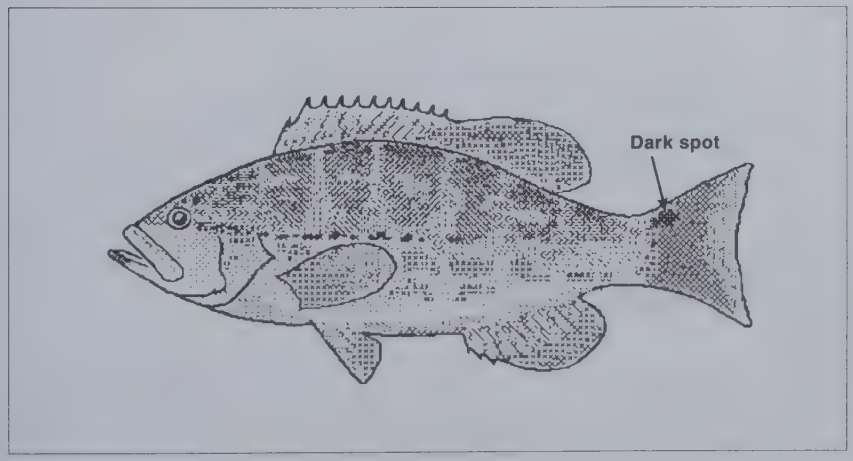

Figure 56
Yellowmouth grouper, *Mycteroperca interstitialis*. Phase 5 of five, juvenile. Drawn from a photograph (Bullock and Smith, 1991).

Gag, *Mycteroperca microlepis*

Figures 57 and 58

Body usually brownish to olive gray or sometimes dark gray. Dark or dusky stripes and bands radiate from eye. Numerous ocellated blotches ("kiss marks"), which may be faint in some specimens. Gilmore and Jones (1992) observed specimens with five brown saddle-blotches along the dorsal-fin base. Soft dorsal, caudal, anal, and, occasionally, pelvic fins with pale or white margins. Large adult males (66 kg) occasionally with dusky pigmentation on belly (Bullock and Smith, 1991). Other large adult males have been observed with dark pigmentation in several areas: at the tip of the upper and lower jaw; along the body beneath the base of the soft dorsal fin to the caudal peduncle; on the soft dorsal fin, belly, pelvic fins, and anal fin; and along the margins of the pectoral and caudal fins (Gilmore and Jones, 1992). Lobe present at the angle of the preopercle. Maximum size: 122 cm (25 kg), but smaller individuals <61 cm are more common. Range: western Atlantic, from Bermuda to Brazil, including the Gulf of Mexico. Juveniles are reported to occur in seagrass beds.[2]

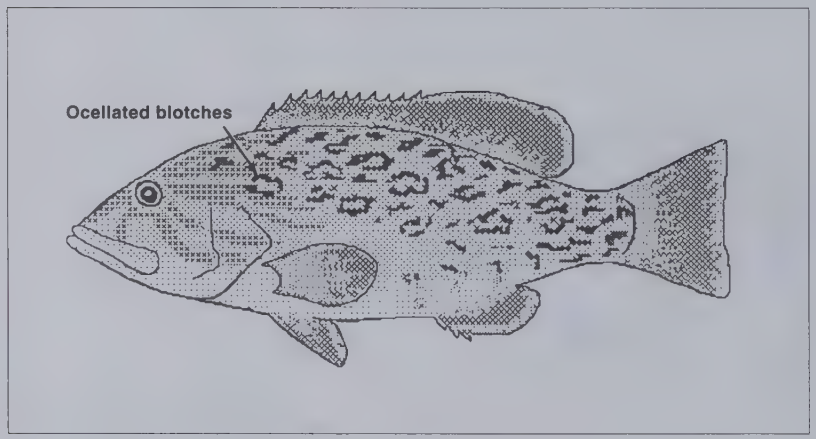

Figure 57
Gag, *Mycteroperca microlepis*. Phase 1 of two, adult.

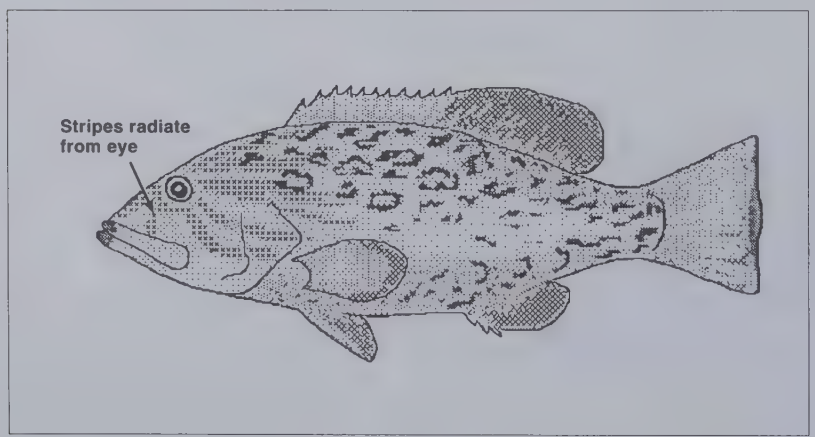

Figure 58
Gag, *Mycteroperca microlepis*. Phase 2 of two. Redrawn from Gilmore and Jones (1992).

Scamp, *Mycteroperca phenax*

Figures 59–62

Body light or dark brown depending on phase. Numerous spots along head and body form broken dusky bands or rectangular blotches. Pectoral fins sometimes dark and may have light or dark narrow margins. Dark phase may have dark rectangular blotches along head and body. A light phase is documented with a large dark blotch that extends from the head towards the posterior edge of the soft dorsal and with a dark margin on the caudal fin. A yellow wash in area of mouth is sometimes visible (Smith, 1971). Some adults have elongate rays on the soft dorsal, anal, and caudal fins referred to as a "broom tail." Elongate caudal-fin rays are generally longest at the upper and lower caudal-fin tips. Caudal fin truncate or, occasionally, concave. Serrated lobe at angle of preopercle. Maximum size: 61 cm. Range: western Atlantic, from Massachusetts to the north coast of South America, including the Caribbean and Gulf of Mexico. May be confused with yellowmouth and white groupers.

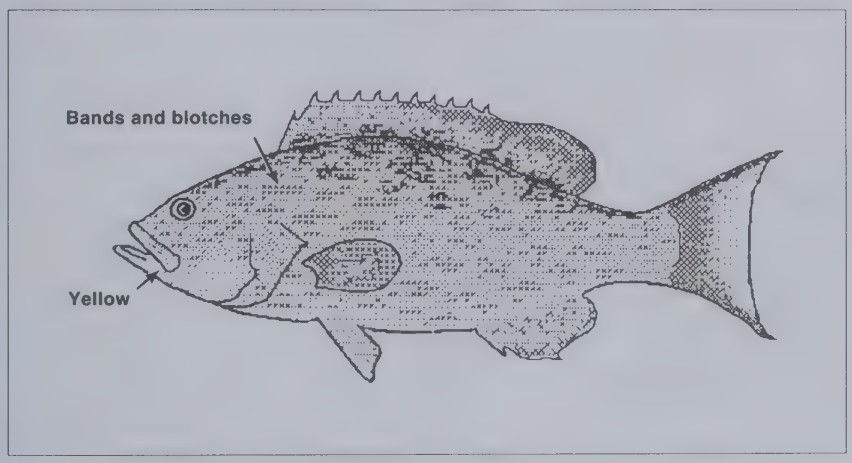

Figure 59
Scamp, *Mycteroperca phenax*. Phase 1 of four, adult.

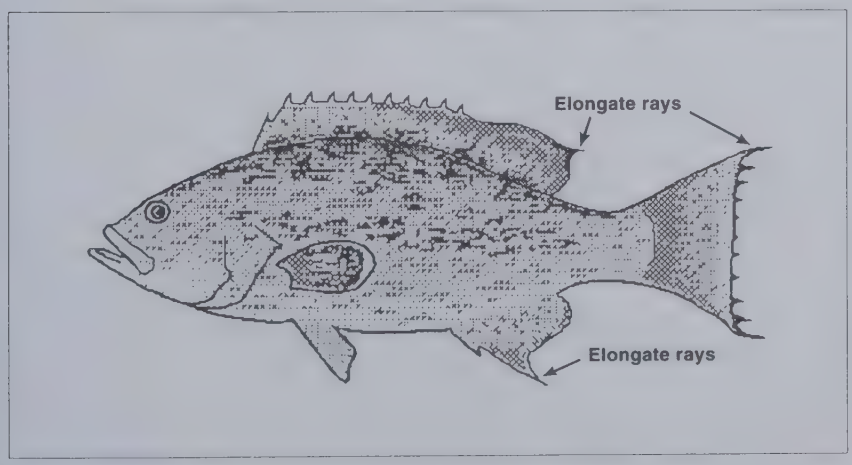

Figure 60
Scamp, *Mycteroperca phenax*. Phase 2 of four, adult, light phase with elongate rays.

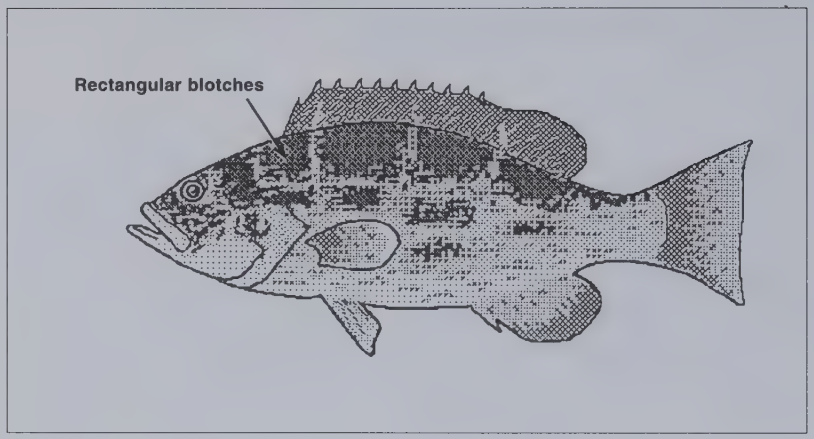

Figure 61
Scamp, *Mycteroperca phenax*. Phase 3 of four, adult, dark phase.

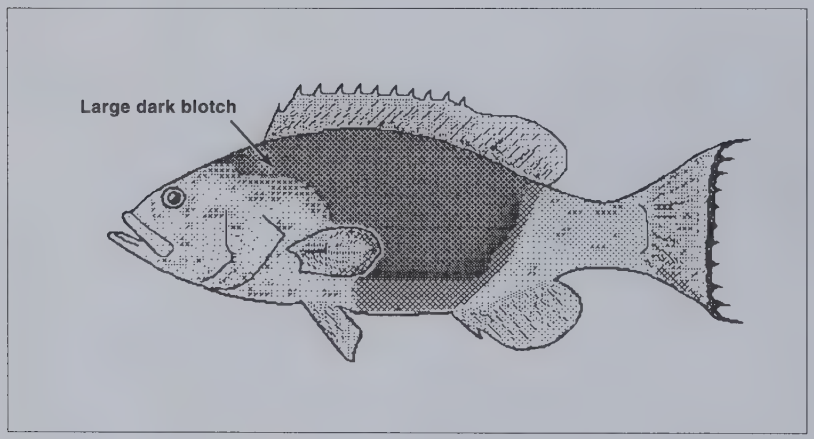

Figure 62
Scamp, *Mycteroperca phenax*. Phase 4 of four, adult, light phase with dark blotch.

Tiger Grouper, *Mycteroperca tigris*

Figures 63–66

Body varies from gray, dark brown, black, to sometimes bright red (Humann, 1989). Head and body with hexagonal spots and 9–11 oblique or vertical bars. Pectoral fin with orange or yellow margin. Spinous dorsal-fin tips may be yellow. Adults with soft dorsal, caudal, and anal fins often with dark margins. A male reproductive phase with diffuse vertical bars and the ventral-posterior region with a broad pale blotch has been reported at a spawning aggregation.[8] Juveniles may be bright yellow with a horizontal dark band or with oblique or vertical bars and a few dark spots; large adults may have elongate rays on soft dorsal, caudal, and anal fins (Bullock and Smith, 1991). Canine teeth large. Angle of preopercle rounded. Eight gill rakers on the lower limb separates the tiger grouper from other *Mycteroperca* species. Maximum size: 102 cm (44 kg). Range: western Atlantic, from Bermuda to Brazil, including the Gulf of Mexico, the Bay of Campeche (Mexico), and the West Indies.

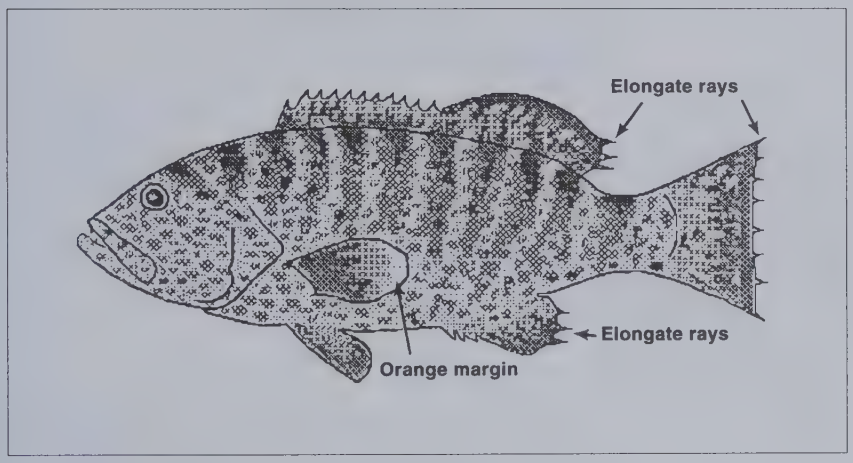

Figure 63
Tiger grouper, *Mycteroperca tigris*. Phase 1 of four, adult.

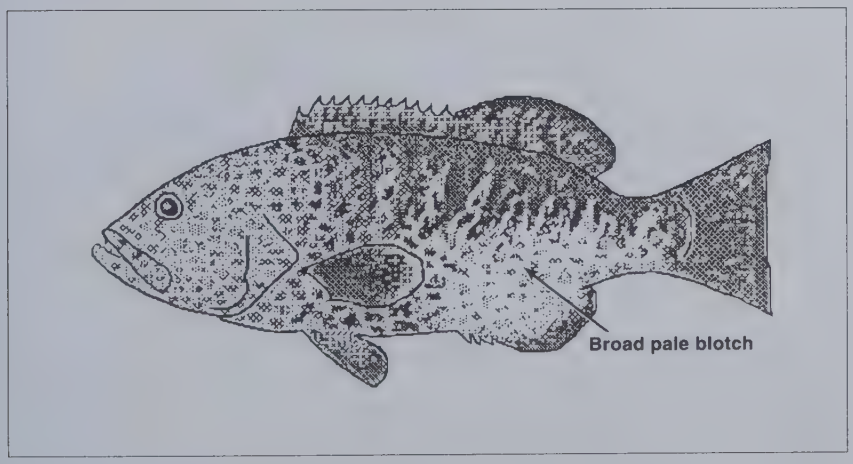

Figure 64
Tiger grouper, *Mycteroperca tigris*. Phase 2 of four, male reproductive phase at a spawning aggregation. Drawn from a photograph (see text footnote 8).

[8] Sadovy, Y., P. Colin, and M. Domeier, Caribbean Fishery Management Council, Hato Rey, Puerto Rico, unpubl. manuscr.

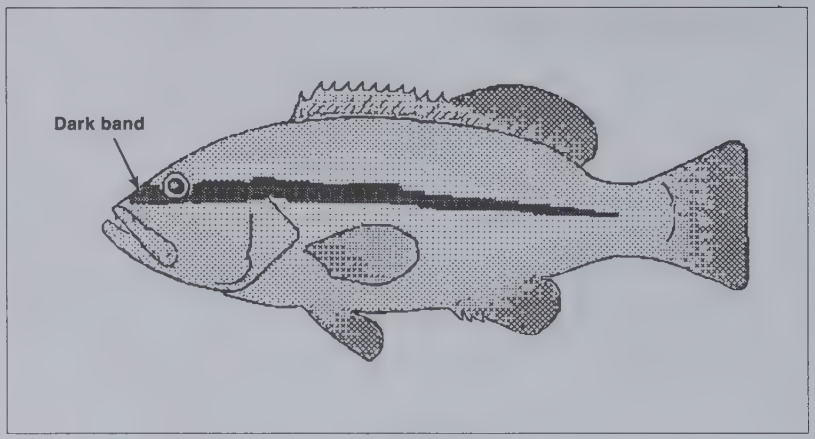

Figure 65
Tiger grouper, *Mycteroperca tigris*. Phase 3 of four, yellow juvenile. Drawn from a photograph (Bullock and Smith, 1991)

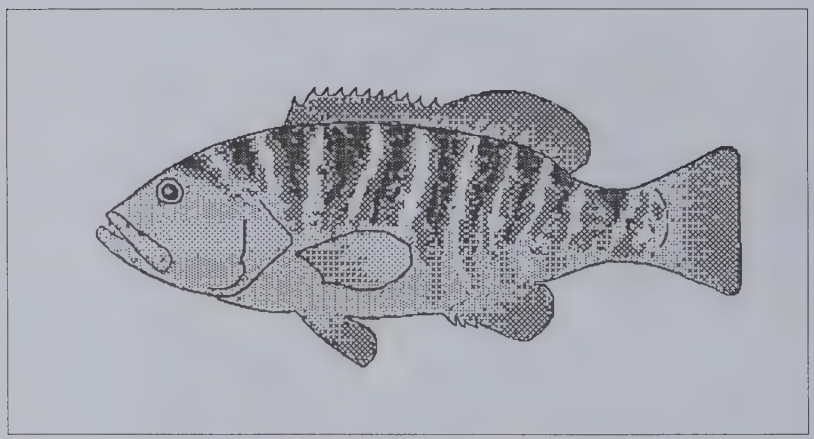

Figure 66
Tiger grouper, *Mycteroperca tigris*. Phase 4 of four, juvenile with bars. Drawn from a photograph (Bullock and Smith, 1991).

Yellowfin Grouper, *Mycteroperca venenosa*

Figures 67 and 68

Body color and spotting patterns highly variable, with specimens colored gray, olive, red, or, sometimes, almost black. Head and body covered with many oval or "peanut-shaped" blotches and with numerous small dark red or orange spots superimposed throughout. Pectoral fin with broad yellow margin. Posterior sections of the dorsal, caudal, anal, and, sometimes, pelvic fins dark or with dark submarginal bands and narrow white margins. Preopercle smooth, without a distinct notch. Maximum size: 91 cm (55 kg). Range: western Atlantic, from Bermuda to Brazil, including the Bahamas, West Indies, and Gulf of Mexico.

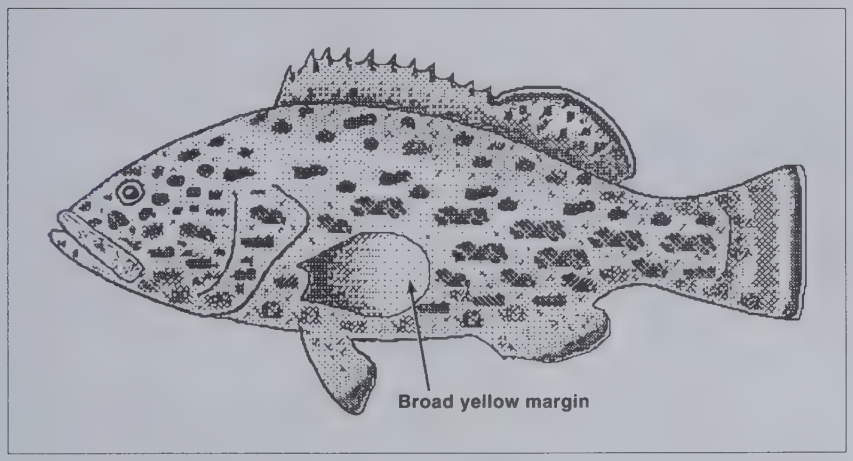

Figure 67
Yellowfin grouper, *Mycteroperca venenosa*. Phase 1 of two, adult, light phase.

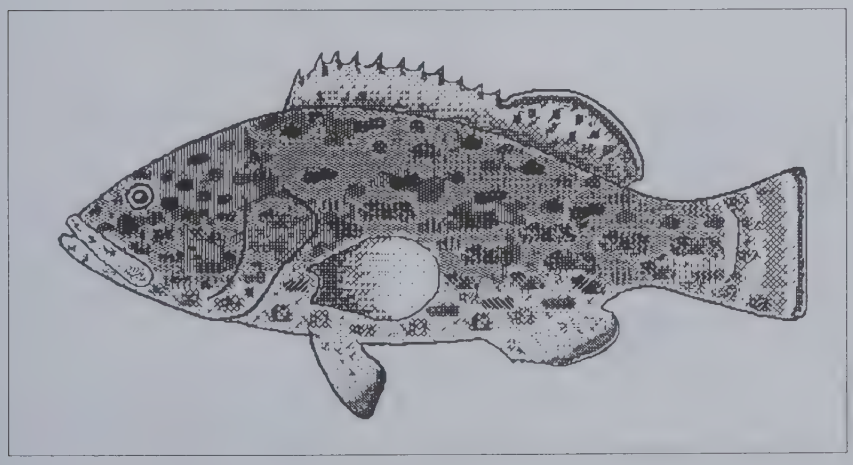

Figure 68
Yellowfin grouper, *Mycteroperca venenosa*. Phase 2 of two, adult, dark phase.

Creole-fish, *Paranthias furcifer*

Figures 69 and 70

Body reddish brown with countershading dark dorsally and light ventrally. Usually three or four spots that may be either white or dark behind the head and above the lateral line. May exhibit a series of irregular white blotches along head and body. Caudal fin often with pale margin. Upper base of the pectoral fin with a distinct red spot; interspinous membranes of the spinous dorsal with a series of yellowish spots. This grouper is characterized by a deeply forked caudal fin. Known to form aggregations. Maximum size: 38 cm. Range: distributed in the western Atlantic from Bermuda to Brazil throughout the Caribbean and Gulf of Mexico.

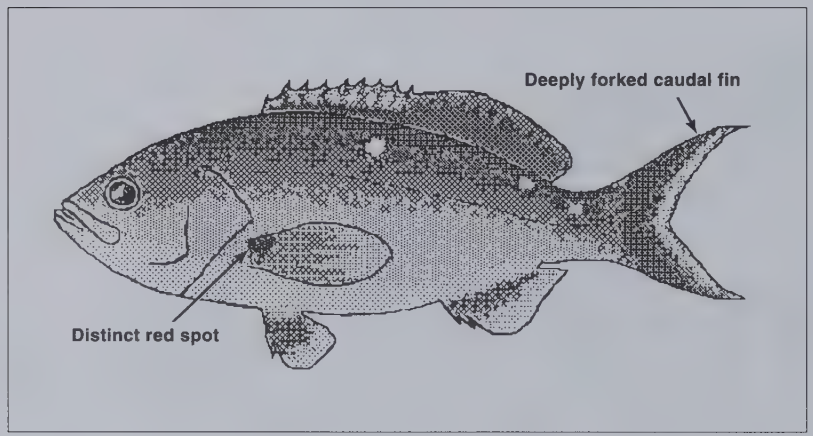

Figure 69
Creole-fish, *Paranthias furcifer.*
Phase 1 of two, adult.

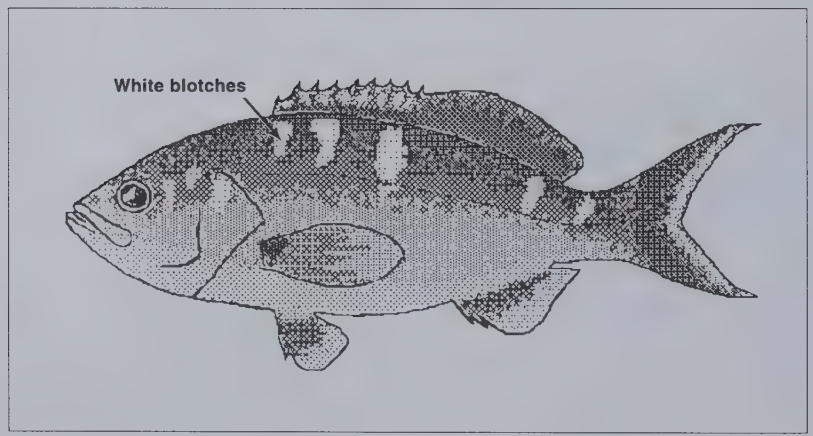

Figure 70
Creole-fish, *Paranthias furcifer.*
Phase 2 of two, adult.

Table 2
Meristic values for groupers (Serranidae) from the western North Atlantic.

Species	Meristic Values[1]	Sources[2]
Mutton hamlet, *Alphestes afer*	D. XI, 16–19 A. III, 8–9 Gr. 21–24	7, 9, 10
Graysby, *Cephalopholis cruentata*	D. IX, 13–15 A. III, 8 Gr. 18–21	1, 5, 6, 7, 9, 10
Coney, *Cephalopholis fulva*	D. IX, 14–16 A. III, 8–9 P. 18 Gr. 23–27	1, 6, 7, 9, 10
Marbled grouper, *Dermatolepis inermis*	D. XI, 17–20 A. III, 8–10 P. 18–19 Gr. 19–23	1, 5, 6, 7, 9, 10
Rock hind, *Epinephelus adscensionis*	D. XI, 16–17 A. III, 8–9 P. 18–19 Gr. 23–28	1, 5, 6, 7, 8, 9, 10
Speckled hind, *Epinephelus drummondhayi*	D. XI, 15–16 A. III, 8–9 P. 17–18 Gr. 23 or 25–28	1, 5, 6, 8, 9, 10
Yellowedge grouper, *Epinephelus flavolimbatus*	D. XI, 13–15 A. III, 8–9 P. 17–19 Gr. 23–26	1, 5, 6, 8, 9, 10
Red hind, *Epinephelus guttatus*	D. XI, 15–17 A. III, 8–9 P. 16–17 Gr. 24–28	1, 5, 7, 9, 10
Jewfish, *Epinephelus itajara*	D. XI, 15–16 A. III, 8 P. 19 Gr. 19 or 21–24	1, 5, 6, 7, 8, 9, 10
Dusky grouper, *Epinephelus marginatus*	D. XI, 14–16 A. III, 8 P. 17–19 Gr. 21–26	4, 8, 9, 11
Red grouper, *Epinephelus morio*	D. X–XI, 15–18 A. III, 8–10 P. 16–18 Gr. 22–25	1, 5, 6, 7, 8, 9, 10
Misty grouper, *Epinephelus mystacinus*	D. XI, 13–15 A. III, 9 P. 18–19 Gr. 22–26	1, 8, 9, 10
Warsaw grouper, *Epinephelus nigritus*	D. X, 13–15 A. III, 9 P. 18–19 Gr. 21–25	1, 5, 6, 8, 9, 10
Snowy grouper, *Epinephelus niveatus*	D. XI, 13–16 A. III, 8–9 P. 17–19 Gr. 22–27	1, 5, 6, 8, 9, 10
Nassau grouper, *Epinephelus striatus*	D. XI, 16–18 A. III, 8 P. 17–19 Gr. 22–26	5, 7, 9, 10
Spanish flag, *Gonioplectrus hispanus*	D. VII–VIII, 13 A. III, 7 P. 16–17 Gr. 20–24	1, 3, 5
Comb grouper, *Mycteroperca acutirostris*	D. XI, 15–17 A. III, 10–12 P. 15–17 Gr. 45–56	2, 5, 7, 9, 10, 11
Black grouper, *Mycteroperca bonaci*	D. XI, 15–18 A. III, 10–13 P. 15–17 Gr. 19–27	1, 2, 5, 7, 9, 10
White grouper, *Mycteroperca cidi*	D. XI, 14–17 A. III, 10–12 P. 15–18 Gr. 26–35	2, 6, 7, 9
Yellowmouth grouper, *Mycteroperca interstitialis*	D. XI, 15–18 A. III, 11–12 P. 16–17 Gr. 23–28	1, 2, 7, 9, 10
Gag, *Mycteroperca microlepis*	D. XI, 16–19 A. III, 10–12 P. 16–18 Gr. 21–29	1, 5, 9, 10
Scamp, *Mycteroperca phenax*	D. XI, 15–19 A. III, 10–12 P. 16–17 Gr. 22–31	1, 2, 5, 7
Tiger grouper, *Mycteroperca tigris*	D. XI, 16–17 A. III, 10–11 P. 16–17 Gr. 8–15	1, 2, 7, 9, 10
Yellowfin grouper, *Mycteroperca venenosa*	D. XI, 15–17 A. III, 10–12 P. 16–17 Gr. 23–27	1, 2, 6, 7, 9, 10
Creole-fish, *Paranthias furcifer*	D. IX, 17–19 A. III, 8–10 P. 19–21 Gr. 35–41	1, 4, 5, 7, 9

[1] Abbreviations: D. = dorsal-fin rays, A. = anal-fin rays, P. = pectoral-fin rays, and Gr. = gill rakers. Roman numerals indicate number of fin spines; arabic numerals indicate number of either soft fin rays or gill rakers. Gill raker counts include rudiments.

[2] Sources: 1 = Bullock and Smith, 1991; 2 = Cervigon and Valasquez, 1966; 3 = Cervigon, 1971; 4 = Heemstra, 1991; 5 = Hoese and Moore, 1977; 6 = Matsuura, 1983; 7 = Randall, 1968; 8 = Rivas, 1964; 9 = Smith, 1971; 10 = Smith, 1978; 11 = Smith, 1981.

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